MATERIALS BUREAU

MATERIALS METHODS 9.1M

# PLANT INSPECTION OF PORTLAND CEMENT CONCRETE (METRIC)

OCTOBER 2005

NEW YORK STATE DEPARTMENT OF TRANSPORTATION

GEORGE E. PATAKI, Governor

THOMAS J. MADISON, Commissioner

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**Title: MATERIALS METHOD 9.1M - PLANT INSPECTION OF PORTLAND CEMENT CONCRETE**

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| | ☐ ____________( ) | John E. Rondinaro, Director, Materials Bureau — 10/28/05 Date |

**ADMINISTRATIVE INFORMATION:**

- Effective Date: This Engineering Bulletin (EB) is effective upon signature.
- Superseded Issuances: No Engineering Instructions, Directives, or Bulletins are superseded by this EB. The following Materials Bureau publication is superseded by this issuance: MM 9.1M, titled; "Materials Method 9.1M - Plant Inspection of Portland Cement Concrete (Metric)"dated January 2002; and Materials Procedure 90-1, titled "Microsilica 711-11 Sampling and Testing" dated July 11, 2003.
- Disposition of Issued Materials: The issued Materials Method will be maintained by the Materials Bureau.

**PURPOSE:** This EB announces the availability of, and issues the revised Materials Method (MM) 9.1M "Plant Inspection of Portland Cement Concrete"- October 2005.

**TECHNICAL INFORMATION:** MM 9.1M is a technical manual which is referenced in various Portland Cement Concrete (PCC) Specifications. The purpose of the manual is to provide guidance for individuals involved in the inspection and documentation of Portland Cement Concrete production. The manual is used by the PCC producer's Quality Control staff and the Department's Quality Assurance staff.

**IMPLEMENTATION:** The revised manual is effective upon signature.

**TRANSMITTED MATERIALS:** The revised manual is attached to this issuance and is available electronically as stated below.

**BACKGROUND:** Various editorial and technical revisions to the existing Materials Method have been made since it's issuance in January 2002. Some of these revisions were implemented during subsequent reprinting in 2003. Although each revised page of the reprinted manual was identified with an individual "revised date", the manual's cover and signature page did not clearly identify the fact that the manual had been revised.

**DISTRIBUTION:** The revised manual will be distributed to the Department's Regional Materials offices, Inspection Agencies, and Approved Precast PCC QC/QA producers. In addition, an electronic version of the manual will be available on the Department's web site at www.dot.state.ny.us , "Publications", "Materials Bureau Forms and Manuals", or by contacting the Materials Bureau @ 518-457-5642.

**CONTACT:** For questions regarding this EB or MM 9.1M, contact Thomas Izykowski of the Materials Bureau at (518) 485-5282 or by e- mail at tizykowski@dot.state.ny.us .

| NEW YORK STATE DEPARTMENT OF TRANSPORTATION<br>MATERIALS BUREAU ALBANY, NY 12232<br>**MATERIALS METHOD** | MATERIALS METHOD: 9.1M<br><br>ISSUE DATE: October 5, 2005<br>Subject Code: 7.42-1 |
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| SUBJECT: **PLANT INSPECTION OF PORTLAND CEMENT CONCRETE (METRIC)** | |
| APPROVED: John E. Rondinaro, Director, Materials Bureau | Supersedes: MM 9.1M<br>Dated: January, 2002 |

# PREFACE

Materials Method 9.1M describes Department practices involved in the plant inspection of portland cement concrete mixes. Full conformance with Materials Method 9.1M will provide uniform inspection procedures at the plant, in an effort to minimize the chance of unacceptable concrete being incorporated into Department projects. A secondary purpose is to provide proper documentation of the acceptability of the concrete as it leaves the plant.

It should also be noted that the inspection procedures outlined herein are inspection procedures conducted on behalf of the purchaser (the Department) and are in no way to be construed as an assumption of responsibility by the Department for the production of acceptable material. Regardless of the level of inspection, it remains the responsibility of the Contractor to furnish every batch of material in compliance with the Specifications. The inspection procedures detailed herein are limited to sampling rates practical for fulfillment by one individual. Therefore, it is possible for unacceptable material to be delivered to the project. It is the responsibility of the Engineer to provide field inspection of the concrete as outlined in Materials Method 9.2 "Field Inspection of Portland Cement Concrete" and reject the unacceptable material.

A Plant Inspector may suggest methods for improvement of plant operations, but is not obligated to accept unacceptable material pending correction of the conditions which produced it; or do such suggestions by the Plant Inspector bind the Department to the acceptance of material outside the Specifications in the event that the application of an Inspector's recommendation did not have the expected result.

The testing frequencies outlined in this method should be followed as closely as possible. However, it is recognized that in certain situations the Inspector must emphasize one test and/or inspection procedure to the detriment of others in order to insure correction of extreme plant deficiencies. Therefore, as long as the Regional Materials Engineer is kept informed and the situation is noted in his diary, the Inspector may deviate at times from strict conformance to these testing frequencies.

Materials Method 9.1M consists of four (4) Sections and Appendices. Sections 1 through 3 contain procedures that the Plant Inspector should use while inspecting and documenting the production of concrete. Section 4 describes the inspection approval procedures performed normally by either the Regional Materials Engineer and his staff or by representatives of the Materials Bureau as indicated.

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|---|---|---|---|---|
| Control Tests | Coarse Aggregate Gradation | 1 test / 375c.m.(Structural)* 1 test / 750c.m.(Pavement)* | BR 317 M | Appendix B |
| | Coarse Aggregate Cleanness | As necessary | BR 317 M | Appendix C |
| | Fine Aggregate Gradation | 1 test / 375c.m.(Structural)* | BR 317 M | Appendix D |
| | Fine Aggregate Fineness Modulus | 1 test / 750c.m.(Pavement)* | | Appendix E |
| | Aggregate visual Identification | 1 test per Day | BR 317 M | Appendix F |
| | Aggregate Free Moisture Content | Fine- 1 test per Day Coarse - As necessary | BR 317 M | Appendix G |
| | Microsilica pH | Daily and each delivery | Diary | Appendix I |

* At this rate but no less than one test per day

| | | | | |
|---|---|---|---|---|
| Equipment Checks | Moisture Meter | Daily | Diary | Section 2-3.02 |
| | Moisture Compensator | Weekly | Diary | Section 2-3.032 |
| | Batching Interlocks | Weekly | Diary | Section 2.3034 |
| | Recordation | Daily | Diary | Section 2-3.04 |
| | Scale Accuracy | 90 days | BR 191 | Appendix K & M.M.# 27 |
| | Meter Accuracy | Annually | Diary | Appendix K & M.M. # 27 |

| | | | | |
|---|---|---|---|---|
| Record Keeping | Production Records | Daily | — | Section 3-3 |
| | Issue Acceptance | Daily, each project | BR 316a | Section 3- 4 |

# SECTION I

# INTRODUCTION

## 1-1 GENERAL

All portland cement concrete ingredients shall be batched according to mix designs prepared by or approved by the Department. The materials used in the concrete shall appear on the Department's Approved Lists prior to their use.

All concrete intended for use on Department projects shall be proportioned by an approved automated batch, or central mix facility, or in an approved mobile concrete mixing unit. The concrete is normally produced under the inspection of a plant inspector assigned by the Regional Director or his representative. When plant inspection is not feasible, small quantities of concrete produced at approved plants may be accepted based on a producer's certification that the concrete meets specifications. This option is limited to small quantities (≤ 20 cubic meters (25 c.y.)) and must be prearranged with the Regional Materials Engineer.

The concrete shall be delivered to the project and point of deposition in approved mixing and/or haul units.

## 1-2 INSPECTION PROGRAM

The Department uses an inspection program which inspects the portland cement concrete as it is manufactured at the plant to assure good quality material. This minimizes the risk both to the Department and the Contractor of placing unacceptable concrete in the work. A secondary purpose is to provide proper documentation of the acceptability of the concrete as it leaves the plant.

Although the inspection procedures are comprehensive, they are limited to sampling rates practical for one individual to accomplish. It is possible to have unacceptable material delivered to the project. In such instances, it is the responsibility of the Engineer in Charge to reject any material found to be unacceptable.

It is recognized that in certain situations, the Inspector must devote his or her attention to one test or inspection procedure in order to insure correction of a particular plant deficiency. When this happens, the Inspector may need to deviate from the required testing frequencies providing that he or she notes this situation in the Inspector's diary.

## 1-3 PLANT INSPECTOR'S RESPONSIBILITY

Portland cement concrete may be mixed at the plant, at the placement site or in transit depending upon the type of mixing and delivery system that is used. The Plant Inspector's responsibility is limited to inspecting the operations that take place at the plant. Once the mixer or haul unit departs from the plant, the Project Inspector assumes the responsibility of inspecting the remaining operation.

The Plant Inspector is particularly responsible for assuring specification compliance by the Producer by performing the following duties:

1. Assuring that only approved materials are incorporated in the concrete.

2. Inspecting plant production to provide assurance that the materials incorporated in the concrete are properly proportioned.

3. Inspecting plant equipment, mixers, haul units and operating procedures to assure uniform production.

4. Maintaining production records and other administrative procedures.

## 1-4 INFORMATION SOURCES

A Plant Inspector, in order to be effective, must be aware of all the pertinent criteria related to their work. This Section makes reference to the various sources of information, in addition to this Method, that must be consulted by the Inspector.

| SOURCE | INFORMATION |
| --- | --- |
| Current Specification Book (including all Addenda, Engineering Instructions or Bulletins) that pertain to material being produced for the project. | Section 501 of the Standard Specifications including: Material Requirements, Concrete Batching Facility Requirements, Concrete Mixer and Delivery Unit Requirements, Proportioning, Handling, Measuring and Batching Materials, Concrete Mixing, Transporting and Discharging |
| Approved List of Products | Air Entraining Agents; Water Reducing and Set Retarding Admixtures; Manufacturers of Portland Cement, Blended Cement, Fly Ash, Microsilica, GGBFS |
| Approved List of Sources of Fine and Coarse Aggregates | Aggregate Source Numbers; Aggregate Test Numbers; Aggregate Specific Gravities; Aggregate Absorptions; Aggregate Limitations for use |
| Materials Methods 10, 10.1, 10.3 | Portland Cement Inspection and Sampling of Cement at Batch Plants |
| Materials Method 18.1 | Sample Transmittal Instructions |
| MURK Part 1B (Current Edition) | Construction Inspection Manual (Section 500) |

INSPECTOR'S CHECKLIST

1. Do you understand your responsibilities?
2. Do you have the required sources of information?

# SECTION 2

# CONCRETE PRODUCTION INSPECTION

## 2-1 GENERAL

This section describes the procedures that the Plant Inspector shall use for inspecting, testing and controlling the batching and mixing of portland cement concrete. Inspection procedures relating to approval of equipment by the Regional Materials Engineer or his representative are covered in Section 4.

Before any concrete production begins, the Plant Inspector should have information concerning the following items:

1. Annual plant approval with noted limitations.

2. Mix design (Either design sheet or computer printout)

3. Explanation of symbols used for recordation purposes

4. Aggregate certificates

5. Aggregate absorptions

## 2-2 MATERIALS

The Plant Inspector shall inspect the plant operations to assure the Department that only approved materials are incorporated in the concrete.

### 2-2.01 Aggregates

The aggregates used in the production of portland cement concrete shall be approved for quality prior to their use. The gradation (including fine aggregate fineness modulus), cleanness and moisture content shall be determined at the plant for acceptance and/or control. The aggregate gradation control procedures in this manual are established to control the aggregate by testing during production. However, the Regional Materials Engineer may choose to perform gradation (including fine aggregate fineness modulus) and cleanness tests on the aggregate as the stockpiles are made at the plant. When acceptance tests are performed while the stockpile is being made, the aggregate gradations shall be within specifications for each size in order for the stockpile to be accepted. For either method of acceptance testing, the sampling and testing procedures and the test frequencies shall be the same. The test frequencies for stockpile acceptance shall be equivalent to those given for concrete production in Section 2-2.014, Aggregate Tests.

### 2-2.011 Evidence of Acceptability

Each Contractor or Concrete Producer shall submit to the Department prior to production a certification indicating that both coarse and fine aggregates to be incorporated into the work are from approved sources. This certification shall be resubmitted annually. It shall be prepared and signed by a representative of the

Contractor or Concrete Producer and it shall contain the following information for all coarse and fine aggregates:

1. Source Name and Number

2. Test Number

   Typical Test Numbers
   99AF103 (Fine Aggregate)
   99AR 94 (Crushed Stone)
   99AG17C (Crushed Gravel)

3. NYSDOT Size Designation

A new submission of a certification is required whenever any of the following occur:

1. When a different aggregate source is used.

2. When additional aggregate sizes are introduced that have not already been included in the previous certifications for the year.

In addition to source certification, it may be necessary to require a delivery ticket to identify aggregates arriving at the plant site. Those concrete suppliers, receiving aggregate from more than one source, which cannot be differentiated by the Aggregate Visual Identification Test (Appendix F), may at the option of the Regional Director be required to provide a delivery ticket with each shipment of incoming aggregates. The ticket or a legible copy shall be kept on file by the Concrete Producer and available for inspection by the Department.

When used, the delivery ticket shall contain the following information:

1. Source Name and Number

2. NYSDOT Size Designation

3. Name and location of supplier if different from the aggregate source.

4. Quantity

2-2.012 Aggregate Stockpiles

Department approved aggregates shall be stockpiled separately from non-approved aggregates on bases approved by the Regional Materials Engineer. The base shall have adequate drainage and may be formed from aggregates, concrete, metal or wood. The stockpiles shall be made so that aggregate of different sizes and from different sources are separated and contamination from adjacent stockpiles is not possible. If necessary, the Regional Materials Engineer may require that the stockpiles be clearly marked for identification.

2-2.013 Aggregate Sampling Procedures

Samples of aggregate may be taken from stockpiles, conveyor belts or from bin sampling devices installed in the batching plant. The selection of the sampling point for each plant shall be made by the Regional Materials Engineer. In general, aggregates should be sampled as close to the end of the batching process as practical. Samples for daily control testing, or any special testing purpose, shall be taken using procedures outlined in Appendix A, Sampling of Aggregates.

2-2.014 Aggregate Tests

The Plant Inspector shall be responsible for sampling aggregates at various frequencies and performing tests to verify that the aggregates are within specification compliance. The tests shall be performed continuously at the prescribed test frequency regardless of the class of concrete being produced.

The tests listed below are those performed by the Plant Inspector while the plant is in routine operation. A summary listing the frequencies of these tests and other pertinent information is given in the front part of this manual.

Coarse Aggregate Gradation
Coarse Aggregate Cleanness
Fine Aggregate Gradation
Fine Aggregate Fineness Modulus
Aggregate Visual Identification
Aggregate Free Moisture Content

a. Coarse Aggregate Gradation Test

Well-graded coarse aggregates are necessary to produce satisfactory concrete. The gradation also needs to be uniform because large fluctuations drastically affect the workability of the mix, the mix water requirement and the amount of paste needed to bind the aggregates together. The Department's specifications for concrete coarse aggregate gradations are designed to provide suitable workability, strength and durability.

The coarse aggregate gradation test procedure is out lined in Appendix B, Coarse Aggregate Gradation Test. The gradation of each aggregate component that is batched separately shall be determined and then the combined gradation of all coarse aggregates shall be determined mathematically. The action that shall be taken by the Plant Inspector as a result of the test is given in the gradation control procedures outlined in Section 2-2.015, Aggregate Gradation Control.

Routine Test Frequency - A minimum of one test per 375 cubic meters (500 cy) for structural concrete or 750 cubic meters (1000 cy) for pavement concrete production (or major portion thereof). Regardless of quantity produced, at least one test per day shall be performed.

b. Coarse Aggregate Cleanness Test
Coarse aggregates that contain deleterious (minus 75 µm) material (silt, clay, rock flour, etc.) due to the lack of or inadequate washing may cause low concrete strength and poor durability. The coarse aggregate cleanness test is performed to determine the amount of minus 75 µm material.

The coarse aggregate cleanness test procedure is outlined in Appendix C, Coarse Aggregate Cleanness Test. The Plant Inspector takes action on the test results according to the aggregate gradation control procedures outlined in Section 2-2.015, Aggregate Gradation Control.

Routine Test Frequency - Any time a coarse aggregate appears dirty to the Plant Inspector. If a coarse aggregate is within 0.2 % of the maximum specification limit on the minus 75 µm material, increase the testing frequency to one test per day.

c. Fine Aggregate Gradation Test

Large variations in the fine aggregate gradation have a marked affect on the workability and finishing properties of the concrete. The variations also affect the air entraining capabilities of the concrete mixture. For example, excessive amounts of minus150 µm and 75 µm material will often reduce the capability of the concrete mixture to entrain air.

The fine aggregate gradation test procedure is outlined in Appendix D, Fine Aggregate Gradation Test. The Plant Inspector takes action on the test results according to the aggregate gradation control procedure outlined in Section 2-2.015, Aggregate Gradation Control.

Routine Test Frequency - A minimum of one test per 375 cubic meters (500 cy) for structural concrete or 750 cubic meters (1000 cy) for pavement concrete production (or major portion thereof). Regardless of quantity produced, perform at least one test per day.

d. Fine Aggregate Fineness Modulus Test

The fineness modulus of an aggregate is an index used to express the relative coarseness or fineness of its particles. The higher the fineness modulus, the coarser the aggregate. The Department's concrete mix design includes the fineness modulus as part of its criteria.

Determine the Fineness Modulus each time the fine aggregate gradation test is performed. See Appendix E, Fine Aggregate Fineness Modulus Test. If the average of the three most recent test results has changed by more than 0.20 from the value used in the mix design, contact the Regional Materials Engineer to make the appropriate adjustments to the concrete mix design.

e. Aggregate Visual Identification Test

The aggregate visual identification test is performed to assure the Department that the aggregates certified by the Concrete Producer are actually being used. The test is a visual comparison between the aggregates being used and a control sample prepared from material from the certified source. Control samples are to be maintained on site, and changed periodically as the Plant Inspector performs this test in conjunction with coarse and fine aggregate gradation tests. The minimum frequency is one test per day.

The test procedures for the aggregate visual identification test are outlined in Appendix F, Aggregate Visual Identification Test. If the Plant Inspector detects a difference in color or particle shape, which indicates a change in the aggregates, contact the Regional Materials Engineer to verify that certified aggregates are being supplied.

f. Aggregate Free Moisture Content Test

The concrete mix design (batching masses) is computed based on a saturated surface dry condition of all aggregates. The batching masses of sand, coarse aggregate and water must be adjusted to maintain the correct proportions of materials as the moisture in the aggregates varies.

The portland cement concrete batching plants are equipped with a moisture meter that measures the moisture in the fine aggregate bin. This meter provides a continuous reading of the *free moisture* (in excess of saturated surface dry) in the sand. The Plant Inspector determines the accuracy of the moisture meter by comparing the meter reading with the results of the moisture content test. Adjustments to the batch masses of aggregates and water are permitted between (not during) completed batches based on the most recent moisture meter reading.

The aggregate moisture test procedure is outlined in Appendix G, Aggregate Free Moisture Content Test. The minimum frequencies at which the moisture content shall be determined are as follows:

| Aggregate Size | Min. Frequency |
|---|---|
| Fine Aggregate | Daily |
| Coarse Aggregate | As Necessary |

The frequency of the moisture testing shall be increased if visible signs indicate that aggregate moisture contents are variable. This would include a change in aggregate processing, after rainstorms, etc.

An adjustment shall be made in the batching masses when the moisture varies in the fine aggregate by more than one-half (1/2) percent as indicated on the moisture meter. When the moisture content varies by more than one (1) percent from the design value in the coarse aggregate, the Plant Inspector shall notify the Materials Engineer.

If the fine aggregate has a *free moisture* content in excess of eight (8) percent, the fine aggregate shall not be used until the free moisture stabilizes below 8 percent.

2-2.015 Aggregate Gradation Control

The aggregate gradation control shall be based upon the results of the aggregate gradation tests performed according to the procedures and at the frequencies given under Section 2-2.014, Aggregate Tests. Any time visual inspection or test results indicate that the gradation of the aggregate has changed, testing frequencies shall be increased to closely control the situation.

The concrete batching facility shall operate under one of three Phases - Phase I, II or III. The phase in which the plant will be operating at any point in time will depend upon its ability to batch aggregates within the gradation specification limits. There are certain concrete placements that require a steady supply of concrete, for example a bridge deck placement. It is often within the best interest of the State to continue the placement, once it has started, even though the aggregate gradation is outside the specification limits, providing that the properties of the concrete mixture given in the mix design are met.
The Phases are defined below and are shown in Figures 1 and 2. Placements can start only when the plant is in a Phase I condition for fine aggregate and in either a Phase I or II condition for coarse aggregate.

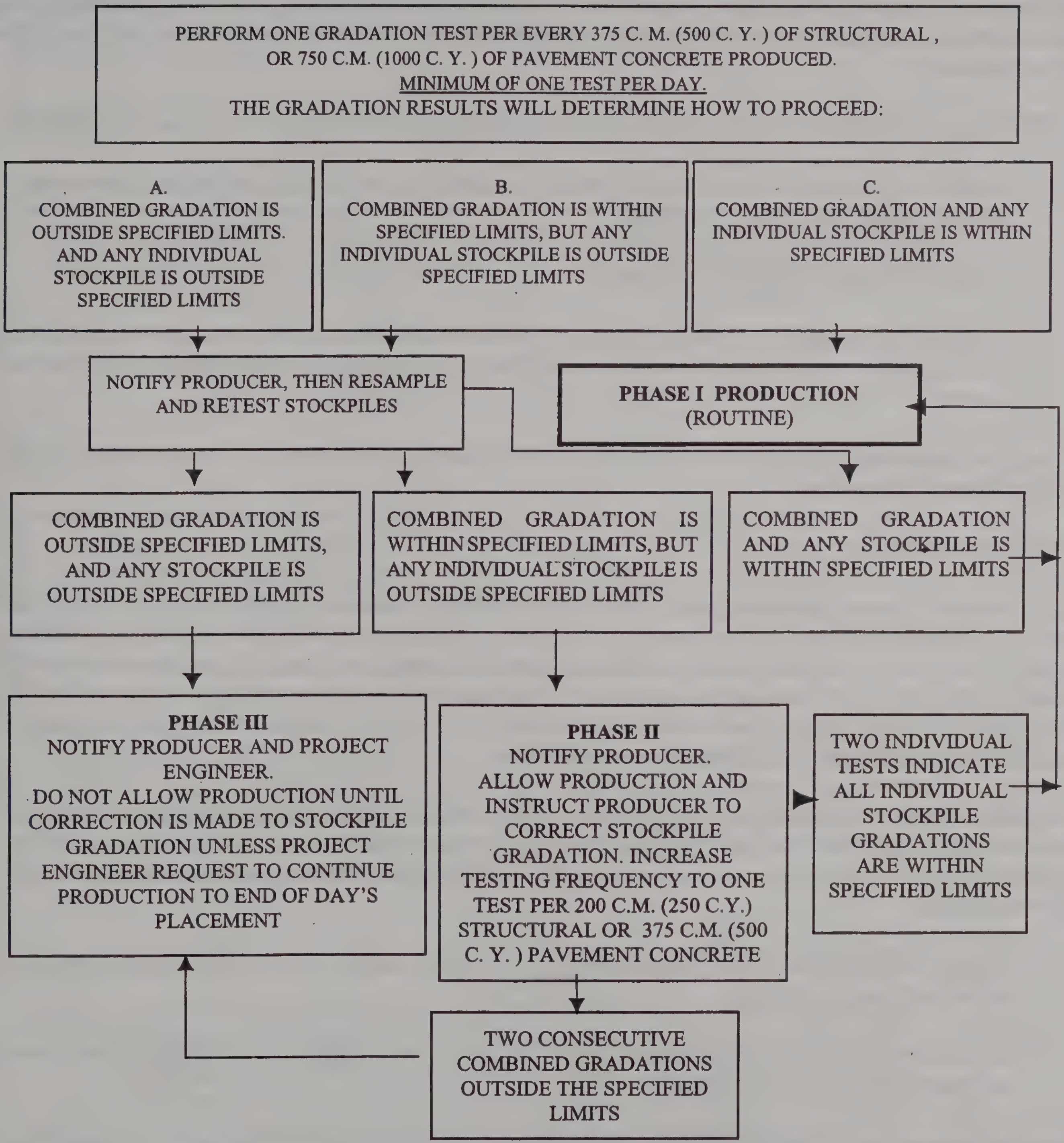
PHASE I OPERATION (ROUTINE PRODUCTION)

A concrete batching facility is in Phase I operation when the gradation of the individual stockpiles are within their respective specification limits and the combined gradation is in the general limits. The gradation limits for the individual coarse and fine aggregates are given in Sections 703-02 and 703-07, and the concrete general limits in Section 501 of the General Specifications unless otherwise specified on the project plans or in the proposal.

If the coarse aggregate gradation test results show that either the stockpiles or the combined gradation is outside of the specification limits, the Plant Inspector shall notify the Producer, then immediately resample and retest the stockpile(s) in question. Depending on the results of the retest, the production will either remain in Phase I or enter Phase II or Phase III as indicated in Figure 1.

If the fine aggregate gradation test results show that the stockpile is outside of the specification limits, the Plant Inspector shall notify the Producer, then immediately resample and retest the material. Depending on the results of the retest, the production will either return to Phase I or be stopped unless the placement must continue (Phase III) as indicated in Figure 2.

## COARSE AGGREGATE GRADATION CONTROL




NOTE: If combined gradation is outside specified limits, and all individual stockpiles are within limits; change the batching percentages

FIGURE 1

## PHASE II OPERATION

Phase II involves only the coarse aggregate gradations. This condition occurs when the individual stockpile gradations are outside of their respective specification limits, but the mathematically combined gradation is within the specification limits given in Section 501 of the General Specification or otherwise indicated in the project proposal.

The Plant Inspector shall take the following steps when a plant enters the condition of Phase II operations:

1. Inform the Producer that the plant is in Phase II condition and that he must start taking the necessary steps to return to the Phase I operation.

2. Inform the Regional Materials Engineer.

3. Increase the sampling and testing frequency to a minimum of one test for every 200 cubic meters (250 c.y.) for structural and 375 cubic meters (500 c.y.) for pavement concrete produced or fraction thereof.

The length of time that the plant can operate in the Phase II condition shall be subject to the approval of the Regional Materials Engineer.

## PHASE III OPERATION

If two consecutive coarse aggregate gradations tests show that the combined gradation or a combination of combined gradation and an individual stockpile (Figure 1), or two consecutive fine aggregate gradations (Figure 2), fail to meet specification limits while the plant is in production, the plant shall be considered in a Phase III condition and production for Department work should stop. At this point the Inspector shall notify the Project Engineer or his representative that the plant is in Phase III condition and that the concrete production should be stopped until the problem is corrected.

If the Project Engineer considers that the placement is critical and it is within the best interest of the State to continue to use concrete from the plant, the Engineer may continue the placement and accept the responsibility for determining the acceptability of the concrete. This determination shall be made at the project in the following manner:

1. Conduct slump and air content tests according to Materials Method 9.2 for specification compliance on at least every two loads.

2. Check the placing and finishing operations for difficulties due to changes in workability, bleed water or other undesirable characteristics.

A plant may operate in the Phase III condition only to complete a concrete placement already in progress. The Producer shall not start producing concrete for new placements. Before concrete production can be resumed for new placements on any project(s), the Producer shall correct or replace the aggregates that are outside specification limits such that the requirements of Phase I or II operation are met.

## FINE AGGREGATE GRADATION CONTROL

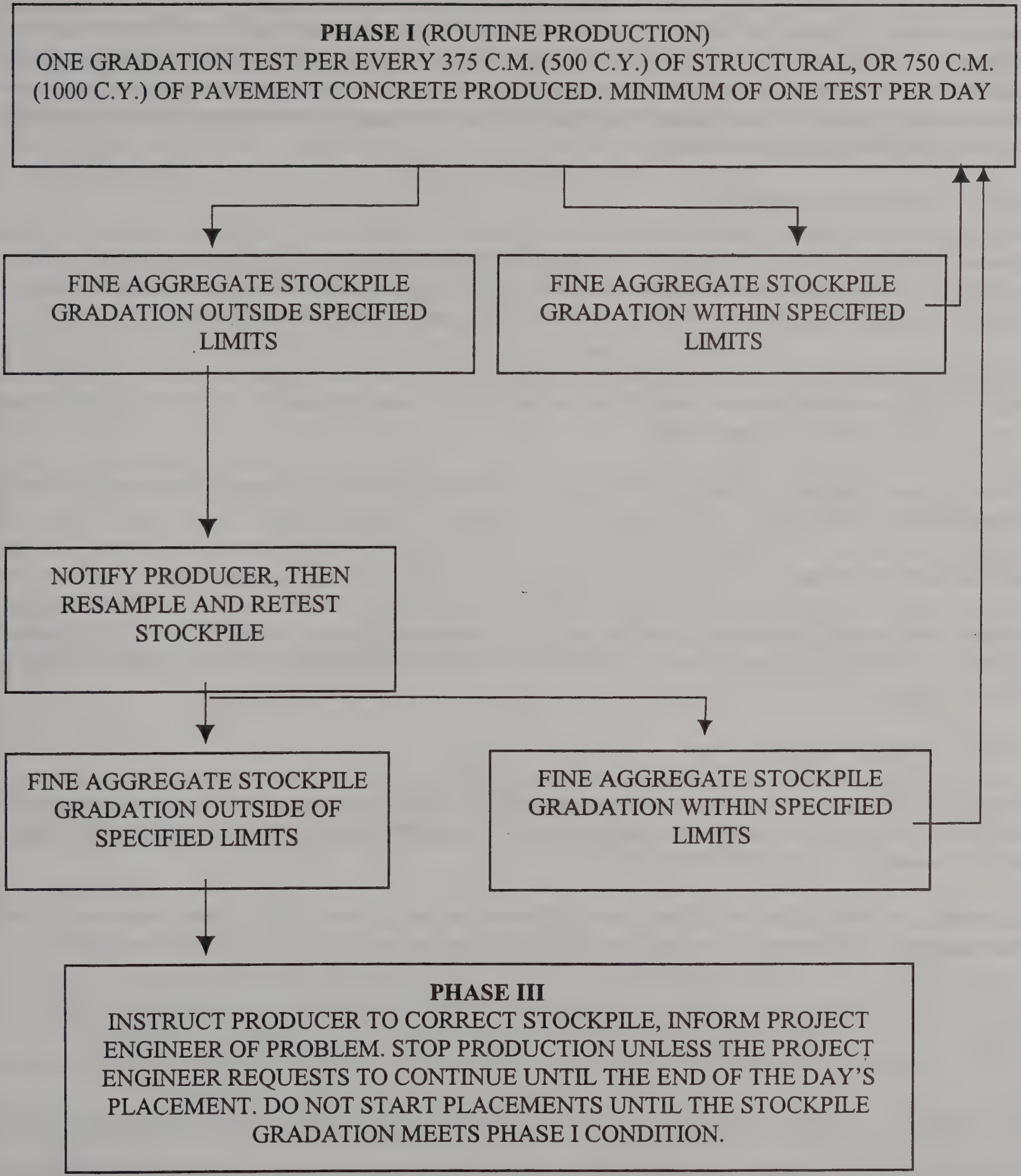



FIGURE 2

2-2.02 Cements and Pozzolans

Portland cement, Blended portland cement, and Pozzolans (Flyash or Ground Granulated Blast Furnace Slag) are supplied to the batching plant in bulk form transported usually either by truck or barge. The materials are either from mills where the manufacturing process has been approved by the Department or from mills where the cement or Pozzolan has been tested and accepted by the Department before shipment. ( Refer to Appendix I for Microsilica sampling and testing)

2-2.021 Evidence of Acceptability

Cement or Pozzolans from mills approved to supply Department work under a certification program must be accompanied by a Cement Shipment Certification form (BR-280), or executed and signed by the manufacturer. These manufacturers are found in the Approved List published by the Materials Bureau.

Cement from mills approved to produce and supply only under Department inspection must arrive in a vehicle sealed by a Department representative and be accompanied by a Cement shipment Authorization form (BR-44) executed by the Department representative.

The details concerning certification, inspection and documentation of portland cement are covered in Materials Method 10.0, 10.1 and 10.3.

2-2.022 Cement Control

Any portland cement that arrives at the plant without the proper evidence of acceptability shall not be used in Department work. Anytime the cement appears to be defective, the Plant Inspector shall notify the Regional Materials Engineer.

2-2.023 Cement Sampling

Cement shall be sampled according to Materials method 10.0 for deliveries made under the cement mill certification program; and cement that is inspected and tested by the Department before shipment shall be sampled according to Materials Method 10.3.

All cement samples shall be sent to the Materials Bureau for testing with a BR-240 form completed by the Plant Inspector. Instructions for completing the BR-240 form are located in Materials Method 18.1.

2-2.03 Admixtures

2-2.031 Evidence of Acceptability

The acceptability of admixtures shall be checked by comparing the brand name located on the container to the Approved List published by the Materials Bureau. This list is updated monthly to show which admixtures are currently approved. The Plant Inspector can check the status of any product not on the list by contacting the Regional Materials Engineer.

2-2.032 Admixture Control
Admixtures must be stored and handled such that freezing will not occur. If the quality of an approved

admixture is determined "suspect" by the Plant Inspector due to freezing, separation, not yielding desired results etc., the Regional Materials Engineer shall be contacted.

2-2.033 Admixture Sampling

Admixtures shall be sampled when requested by the Regional Materials Engineer. When samples are needed, they should be taken from the admixture delivery system bypass valve that is used for quantity calibration. The sample should be put into a clean, watertight one liter (1 quart) container.

If samples must be taken directly from a large bulk storage tank, instructions on sampling should be obtained by the Regional Materials Engineer from the Materials Bureau.

All admixture samples shall be sent to the Materials Bureau for testing with a completed BR-240 form. Instructions for completing the BR-240 form are located in materials Method 18.1.

2-2.04 Water

2-2.041 Evidence of Acceptability

Any water source that is used for human consumption is considered acceptable for the manufacture of concrete. Any other source shall be considered suspect, and should be sampled and tested for conformance with §712-01, unless the Regional Materials Engineer has evidence that the source is acceptable. The condition of water wells may change during periods of high production, especially during the summer construction season. Sediment levels may increase, which may adversely affect the quality of the concrete, and may indicate that the well is running dry.

2-2.042 Water Sampling

A representative sample of water shall be put into a clean watertight, four liter (1 gallon), glass or plastic container. The sample shall be accompanied by a completed BR-240 form and sent to the Materials Bureau for testing. Instructions for completing the BR-240 form are located in Materials Method 18.1.

2-3 BATCHING

The Plant Inspector shall inspect the batching operations to assure the Department that the materials incorporated in the concrete are properly proportioned. The batching equipment is inspected annually and then periodically throughout the season by the Regional Materials Engineer or his representative. However, it is essential that the Plant Inspector is acquainted with all of the equipment and its operation in order to assure that the batching is being performed in the proper manner on a day to day basis.

2-3.01 Weighing Units and Measuring Devices

Aggregates and cement are proportioned by mass while water is proportioned by either mass or volume. Admixtures are proportioned volumetrically.
Each measuring device shall be tested to assure that the accuracy meets the requirements given in Section 501 of the General Specifications. The accuracy of the water scale shall be the same as that specified for the cement and aggregate scales. These devices shall be checked annually prior to use for

Department work, at intervals of not more than ninety (90) days, at any time a plant changes location, or at any time chosen by the Regional Materials Engineer or Plant Inspector. The scale check and water meter procedures are outlined in Materials Method 27, Scale and Meter Accuracy Checks. The Regional Materials Engineer may allow scale and meter checks to be performed by a qualified scale technician in accordance with Materials Procedure #01-01 (See Appendix K). If the weighing unit or measuring device shows that the accuracy is not within specifications, the Plant Inspector shall notify the Producer that the plant cannot produce concrete for Department projects until the device is corrected.

2-3.011 Scales

Scales are generally used to proportion the aggregates and cement. The aggregates are usually batched in a weigh hopper where the proportions are weighed cumulatively. The cementitious materials are usually batched in their own weigh hopper. Some plants, however, have separate weigh hoppers for weighing each aggregate or cementitious material.

The Standard Specifications require that the scales have no less than 500, or more than 2000 graduations, and the scale graduations be in multiples or sub-multiples of 1, 2, or 5 (ie. 0.01, 0.1, 1, 10, etc. or 0.02, 0.2, 2, 20 etc.) as per the National Institute of Standards and Technology (NIST) Handbook 44. The scales will be electronic load cells with digital displays. The digital displays must be located at the operator's work station.

Example- Determination of scale graduations per the Standard Specifications:

CEMENT SCALE: 3,000 kilogram capacity

Try: 3,000 kg ÷ 2000 graduations = 1.5 kg / graduation (This does not meet the requirements of NIST Handbook 44, because the graduation must be a multiple or sub-multiple of 1, 2, or 5)

Try: 3,000 kg ÷ 1000 graduations = 3 kg / graduation ( again, not acceptable per Handbook 44)

Try: 3,000 kg ÷ 1500 graduations = 2 kg / graduation (This is acceptable)

Try: 3,000 kg ÷ 600 graduations = 5 kg / graduation (This is acceptable)

The minimum batch size for the plant is based on scale graduation size. Therefore, the smaller the graduation size, the smaller the minimum batch size. Refer to Section 2.306 for the determination of minimum batch size.

When cementitious material is blown into the storage silo, the vent in the silo must be working properly. If the vent is plugged, the pressure build-up in the silo may cause the cementitious material scale to give an erroneous reading during batching. Therefore, the Plant Inspector should periodically observe the cementitious material scale during the silo loading process.

2-3.012 Meters and Other Volumetric Measuring Devices

Meters are used to proportion admixtures and water. Admixture dispensing systems are required in all plants. Water meters are used at central mix plants and very often at transit mix plants.


Figure 3

a. Admixtures

Preset quantities of admixtures shall be pumped from the storage facility through a volumetric measuring device and discharged in such a manner that will give a uniform distribution of the material throughout the mixture within the specified mixing time. Generally the admixtures are discharged separately into the fine aggregate bin of the weigh hopper or into the water line. Do not permit different types of admixtures to come into direct contact with each other.

The admixture dispensing system shall be equipped with a by-pass valve suitable for determining the accuracy of the system. The accuracy shall be within the delivery tolerance given in Section 501 of the General Specifications. The procedure for determining the accuracy of the admixture dispensing system is given in Materials Method 27.

b. Water

The accuracy of the water meter shall be within one (1) meter graduation, or ± 1% by mass or volume of the indicated quantity on the batching display (whichever is larger). The procedures for determining the meter accuracy are given in Materials Method 27.

In some automatic proportioning systems, the meter is connected to a moisture compensation device which adjusts the amount of water delivered to accommodate the free moisture in the fine aggregate. The moisture compensation device shall be set at zero when performing the accuracy check.

During an accuracy check, the delivered quantity of water to be checked may be obtained through the delivery system by one of the following:

1. Manually metered by the Operator by holding a "manual water feed" button until the desired quantity is reached .

2. A preset quantity is delivered when the Operator pushes a "manual feed button".

3. Metered automatically by requesting a pre-programmed quantity in an automated batch whereas the only ingredient in the batch is water.

2-3.02 Moisture Meter

Each batching plant must be equipped with a moisture sensing device that indicates on a readily visible scale or chart the free moisture content of the fine aggregate as it is batched. The Plant Inspector shall check the moisture meter daily by conducting a free moisture test on the fine aggregate as outlined in Appendix G, Aggregate Free Moisture Content Test and comparing the results to the meter reading. The moisture meter shall be adjusted to match the free moisture content of the fine aggregate by the Producer if there is a difference of more than 0.5 percent between the tested moisture and the meter reading.

2-3.03 Automatic Proportioning Controls

Automated control plants shall be equipped with an automatic proportioning and cycling system to measure the quantity of aggregates, cement, admixtures and sometimes water. An example of a typical system is illustrated in Figure 3. The batching control automatically draws materials in a selected sequence and in the

amount of the pre-programmed masses or volumes set into the system by the Operator. After each material is drawn, except water, the system automatically checks to determine if the quantity is within the batching or delivery tolerances given in Section 501 of the General Specifications. Whenever a weighing error in batching occurs (outside the batching tolerance interlocks), the automatic cycle shall be interrupted until corrective action is taken. Any error that is accepted must be indicated on the batch recordation.

Automatic proportioning systems are required to draw the ingredients until the pre-programmed "target" masses are reached before the batching tolerance check is made by the system. However, some systems are designed to batch to, or seek the "underweight" cut-off point. These systems are not allowed an "underweight" batching tolerance, thereby forcing the system to seek the pre- programmed "target" mass.

The admixture dispensing system shall be interlocked with the automated proportioning equipment so that the quantity of admixture preset into the system has been batched and discharged. Otherwise, the automatic cycle shall be interrupted.

When water is batched automatically at the plant, the water shall be drawn until the pre-programmed target mass or volume is satisfied. The water batched at central mix plants shall be batched to the batching tolerance given in Section 501 of the Standard Specifications. However, no other requirements for batching tolerances or interlocks exist.

2-3.031 Batching Controls

The major batching control functions of modern automatic proportioning systems are generally accessed through the keyboard of a Personal Computer (PC). Some systems may also include a "manual panel" for manual batching if necessary. However, during automatic batching, the only manual operation that is allowed is a switch or button to initiate or discharge a batch. Refer to Materials Method 27 for specific details on Automatic Batching Controls.

2-3.032 Moisture Compensation Device

Although not required, some plants have a moisture compensation device that adjusts the programmed masses of fine aggregate and water, when batched, to account for the free moisture in the fine aggregates. <u>This control may only be used to adjust the target masses *prior to the initiation of the batch*. No adjustments will be permitted once the batching sequence has begun.</u> No adjustments are made by this device for free moisture in the coarse aggregates.

The moisture compensating device shall be checked by the following steps:

1. Set the design mass for the fine aggregate in the control panel.

2. Set a moisture reading on the moisture compensator.

I-3 Select a nominal batch size.

I-4 Determine if the automation equipment adjusts the fine aggregate mass for the amount of free moisture indicated on the moisture compensator. The target mass for the fine aggregate should increase, and the target mass for the water should decrease accordingly. This adjustment must

be within one scale graduation of the desired reading.

I-5 Repeat the above steps for moisture contents throughout the working range of the device.

2-3.033 Batching Tolerances

Batching tolerance for all the materials are given in Section 501 of the General Specifications. These tolerances shall be applied to each batching formula and the acceptable batching range for each mass shall be determined.

The cement, admixture(s) and water batching tolerances shall be based upon the total amount of the respective materials in the batch. The aggregate batching tolerance, however, depends on whether the aggregates are weighed in a cumulative weigh hopper or in individual weigh hoppers. When aggregates are batched in a cumulative weigh hopper, the tolerance shall be based on the total mass of aggregate. When aggregates are batched in individual weigh hoppers, the tolerance shall be based on the individual aggregate masses.

Since the allowable batching tolerances vary with batch size, some automation systems automatically vary the batching tolerance interlock settings when a change is made to the batch size. Plants that do not have the batching tolerance interlock control tied in with the batch size are set for the minimum allowable batching masses.

The minimum allowable batching masses for aggregates and cement are determined by either the Materials Bureau or the Regional Materials Engineer. The procedure for determining these masses is given in Section 2-3.06, Minimum Batch Size. The minimum allowable batch masses are also recorded on the form BR-180, Annual Inspection Record - Portland Cement Concrete Batch Plant.

The zero tolerance is the scale condition that must be satisfied before batching can start. The zero tolerance is based upon the minimum allowable batch mass for each scale multiplied by the batching tolerance for the material being drawn. This value may be a positive or negative number.

Examples are given to illustrate the determination of allowable batching tolerances for the two aggregate weighing systems.

Example 1: Determine the batching, zero tolerances and the acceptable batching range for each mass. The facility is a 7.5 cubic meter plant with a cumulative aggregate weigh hopper. The minimum allowable batch masses as determined in the example in Section 2-3.06 are as follows:

| | |
|---|---|
| Aggregate: | 1000 kg (using 10 kg graduations) |
| Cement: | 400 kg (using 2 kg graduations) |

<u>Aggregate Batching Tolerance</u>

Assume 1800 kg of aggregate per cubic meter. The tolerance for each aggregate draw in a 7.5 cubic meter batch is: 7.5 x 1800 x 0.02 = ± 270 kg.

<u>Cement Batching Tolerance</u>

Assume 360 kg of cement per cubic meter. (Note. This example does not include pozzolan and/ or microsilica) The tolerance for the 7.5 cubic meter batch is 7.5 x 360 x 0.01 = ± 27 kg.

Zero Tolerance

| | |
|---|---|
| Aggregate: | 1000 kg. x 0.02 = ±20 kg. |
| Cement: | 400 kg. x 0.01 = ± 4 kg. |

Batching Masses with Tolerances

| Material | Cumulative Mass | Tolerance | Acceptable Range |
|---|---|---|---|
| Agg. 1 | 4500 kg | ± 270 kg | 4230- 4770 kg |
| Agg. 2 | 9000 kg | ± 270 kg | 8730- 9270 kg |
| Agg. 3 | 13500 kg | ± 270 kg | 13230-13770 kg |
| Cement | 2700 kg | ± 27 kg | 2674-2726 kg* |

* The actual calculated range = 2673 to 2727 kg. However, the 2 kg graduations of the cement scale prevent the system from batching to these masses. Therefore, the tolerance range is narrowed slightly to the nearest batch masses possible.

Example 2: Determine the batching and zero tolerance and the acceptable batching range for each mass. The batching plant is a 7.5 cubic meter plant with an individual weigh hopper for each aggregate. The minimum allowable batch masses from the example in Section 2- 3.06 are as follows:

| | |
|---|---|
| Aggregate: | 1000 kg. for each scale |
| Cement: | 400 kg. |

Aggregate Batching Tolerance

| Aggregate Weigh Hopper | Mass | Tolerance | Mass Tolerance |
|---|---|---|---|
| 1 | 4500 kg. | ± 0.02 % | ± 90 kg. |
| 2 | 4700 kg. | ± 0.02 % | ± 94 kg. |
| 3 | 4500 kg. | ± 0.02 % | ± 90 kg. |

Cement Batching Tolerance

Assume 360 kg. of cement per cubic meter.The tolerance for the 7.5 cubic meter batch is 7.5 x 360 x 0.01 = ±27 kg.

Zero Tolerance

| | |
|---|---|
| Aggregate - each scale: | 1000 kg x 0.02 = ±20 kg |
| Cement: | 400 kg x 0.01 = ± 4 kg |

Batching Masses with Tolerances

| Material | Individual Mass | Tolerance | Acceptable Range |
|---|---|---|---|
| Agg. 1 | 4500 kg. | ±90 kg. | 4410-4590 kg. |
| Agg. 2 | 4700 kg. | ±94 kg. | 4610-4790 kg.* |
| Agg. 3 | 4500 kg. | ±90 kg. | 4410-4590 kg. |
| Cement | 2700 kg. | ±27 kg. | 2674-2726 kg.** |

* The actual calculated range = 4606 to 4794 kg. However, the 10 kg graduations of the aggregate scale prevent the system from batching to these masses. Therefore, the tolerance range is narrowed slightly to the nearest batch masses possible.

** The actual calculated range = 2673 to 2727 kg. However, the 2 kg graduations of the cement scale prevent the system from batching to these masses. Therefore, the tolerance range is narrowed slightly to the nearest batch masses possible.

2-3.034 Batching Interlocks

All automatic batching control systems shall have interlocks to provide assurance that the batched quantities of aggregates, cement and admixture are within specifications. The interlocks shall interrupt the cycle whenever an error occurs during any of the following batching functions:

- Weighing the aggregate and cementitious materials.
- Scale or meter fails to return to zero tolerance.
- Measuring and discharging the admixture.
- Recording the batched quantities of aggregate and cementitious materials and the indication that the admixture was properly batched and discharged.
- Opening and closing of the holding bin gates and the weigh hopper discharge gate(s).
- Mixing time on central mix plants.

A. Weighing Tolerance Interlocks
The weighing tolerance interlocks shall be set at the "underweight" and "overweight" cut-off points. <u>The automation system must be designed to seek the pre-programmed target mass, with allowable free-fall settings to account for material falling between the holding bin and the scale during batching</u>. In general, the "underweight" and "overweight" cut-off points will be equally distant from the programmed target mass. Some automation systems are designed to seek the lowest calculated tolerance mass as the material is being weighed. This configuration does not wait for the

pre-programmed target mass to be reached before it checks to see if the scale mass is in tolerance. It accepts any mass that is within the tolerance range. However, the mass that it accepts is usually below the programmed target mass. Systems that function in this manner will be restricted so the "underweight" tolerance is set to zero.

Some automation systems have "over-riding" or "global" tolerance settings. These systems apply the tolerance for material being weighed by accepting the larger of either;
1: The cumulative total as the material is being weighed, or
2: The cumulative total for all ingredients that will be weighed on the scale for the batch.

Batching Masses with Tolerances

| Material | Individual Mass | Tolerance | Acceptable Range |
|---|---|---|---|
| Agg. 1 | 4500 kg | 4500 x .02 = ±90 kg<br>or 13700 x .02 = ± 270 kg | 4410- 4590 kg<br>or 4230- 4770 kg |
| Agg. 2 | 4700 kg | 9200 x .02 = ±184 kg<br>or 13700 x .02 = ± 270 kg | 9020- 9380 kg *<br>or 8930- 9470 kg |
| Agg. 3 | 4500 kg | 13700 x .02 = ± 270 kg | 13430- 13970 kg |
| Cement | 2700 kg | ±27 kg | 2674-2726 kg ** |

* The actual calculated range = 9016 to 9384 kg. However, the 10 kg graduations of the aggregate scale prevent the system from batching to these masses. Therefore, the tolerance range is narrowed slightly to the nearest batch masses possible.

** The actual calculated range = 2673 to 2727 kg. However, the 2 kg graduations of the cement scale prevent the system to batch to these masses. Therefore, the tolerance range is narrowed slightly to the nearest batch masses possible.

Automation systems that do not have the capability of calculating and applying the tolerance range to various batch sizes shall be set at the tolerance range for the minimum allowable batch masses.

Checking the pre-programmed cut-off masses and interlocks requires the simulation of batching using potentiometer type dials (or an acceptable variation). These devices are commonly referred to as "simulators". The simulators are connected to the load-cell inputs of the automation system. They replicate the electrical change of millivolts in the load cell which is indicated on the primary scale and /or batching screen. The simulators need to be of appropriate design to operate all scales within their working range. Each scale must have its own simulator that has the sensitivity to check batching tolerance interlocks. All interlocks shall be set within one graduation of the desired cut-off points.

B. Zero Tolerance Interlock

The zero tolerance interlock prevents a new batch from being weighed until the weigh hopper is empty of the previous batch and the scale has returned within the zero tolerance. The interlock shall be set at the zero tolerance based upon the minimum batch masses when varying batch sizes are produced.

The position of the interlock can be checked by setting the simulator beyond the zero tolerance limit on the scale and trying to start a new batch. The interlock is okay if the new batch cannot be started. If the zero tolerance interlock can be "overridden" by the operator, there must be an indication on the batch recordation of the tare mass and/ or that the zero tolerance was exceeded when the batch was started.

C. Admixture

The admixture dispensing system shali be interlocked with the automated system so that:

1. Aggregate and/or cement weigh hopper discharge gates cannot be opened until the programmed quantity of admixture has been satisfactorily batched or discharged.

2. The recordation of the completed batch including the quantity of admixture dispensed shall be dependent upon the completion of the admixture discharge.
   The recordation shall identify;
   A. Each admixture dispensed - by name of product (such as POZZ 100, DARAVOX, etc.) by type (such as AEA, RETARDER etc.) or by other acceptable identifier (such as ADMIX 1, ADMIX 2 etc.)
   B. The quantity of each admixture dispensed
   C. Any out of tolerance condition that has been accepted or "overridden" by the operator.

When functioning properly, the automation system should recognize that the admixture is not being dispensed, and has not reached the pre-programmed quantity. The batching sequence shall be interrupted.

The interlocks generally associated with assuring that the quantity of admixture is batched and delivered are as follows:

When the admixture is metered and discharged directly into the truck, the only interlock needed is the one that prevents the recorder from printing until the programmed quantity of admixture is delivered through the meter.

When the admixture is metered, then stored in a holding vial, three interlocks are needed:
- To interrupt the batching sequence if the admixture in the vial is above the "zero probe" prior to initiation of the batch.
- To assure that the pre-programmed quantity has been delivered.
- To assure complete discharge of the admixture from the vial.

Again, the recorder shall print only upon complete discharge of the vial.
The admixture interlocks shall be checked by simulating batching operations to see if the interlocks are functioning properly. A representative from the admixture supplier should be present when this

is performed, for safety and to avoid damage to the dispensing system.

When functioning properly, the automation system should recognize that the admixture is not being dispensed, and has not reached the pre-programmed quantity. The batching sequence shall be interrupted.

Admixture interlock check:

1. Disconnect the delivery line from the storage tank.
   a. Ask for a batch that includes a quantity of the admixture under test that cannot be reached with the delivery line disconnected.
   b. Determine whether the meter will erroneously continue to count pulses after the admixture has ceased to flow through the meter.
   c. Determine whether the batch can be completed if the preprogrammed quantity of admixture has not been reached.
   d. Determine whether the batch recordation has been completed if the admixture had not completely discharged.

2. If the admixture is dispensed through vials or "bottles"; fill the bottle to a level above the zero probe or electrically activate the "empty bottle" probe in the dispensing vials by "jumping out" the zero probe. The automation system must prevent the batch from starting. If the condition is overridden by the operator, it must be indicated on the batch recordation. The meter pulses may be electrically simulated by either spinning the gears (if so equipped) in the meter or, by electrically "pulsing" the terminal connections in the admixture control panel*.
   Follow Steps **1c** and **d** above.

   *WARNING! This procedure is potentially dangerous and <u>must</u> be performed by a qualified representative of either the admixture supplier, the plant, or the automation company. Do not attempt this as an inspector.

D. Inlet and Discharge Gate Interlocks

The aggregate and cementitious materials' inlet gates shall be interlocked with the automatic cycle so that they cannot open while the weigh hopper discharge gates are open. Also, the weigh hopper discharge gates shall be interlocked so that they cannot be opened while the inlet gates are open and the weigh hoppers are being filled.

The interlocks shall be checked by trying to activate these gates by simulating automatic production. The holding bins should be empty or the air or hydraulic system to the plant should be off when these checks are made. If the bins are empty and the air or hydraulics system is on, the Inspector can listen for the opening and closing of the gates. If the air or hydraulics system is off, the Inspector can listen for the "click" of the solenoids that control the air rams or hydraulic pistons.

The weigh hopper discharge gates for aggregate and cementitious materials shall be interlocked so that they cannot be opened until the programmed quantity of cement, aggregate and admixture are within the batching tolerance. These interlocks can be checked by simulating the batching cycle.

E. Mix Timer Interlocks (Central Mix)

Central mix plant shall be equipped with a mix timer(s) that is interlocked with the automation so that it will not let a batch of concrete be discharged until the specified mix time has elapsed. If the mixing time interlock can be overridden, the batch recordation shall show a clear indication that the mixing time was interrupted.The mixing time begins after all materials are in the drum.

The Inspector shall determine the accuracy of the timer and that the mixer and timer are properly interlocked. Depending on what activates the timer, the Inspector may have to determine such things as belt lag time, charging time, etc.

2-3.04 Recorders

Recordation equipment shall be used to provide the Department with a legible visual record of the materials incorporated into the concrete mixture. It shall be electrically connected to the scales, meters, and batching controls such that the quantities of each aggregate component, cement, water at central mix plants and the presence, type and quantity of admixture for each batch of concrete will be recorded. In addition, all records shall show the batch number, mix identification, the day, month, year and time of day to the nearest minute for each batch so that the batch is permanently identified.

The Producer has two options in regard to the type of recordation equipment. These options are digital recordation on either a ticket or a tape. Digital tickets have become the most common form of recordation with modern PC driven automation equipment.

Some of the recorded information is in code form. Therefore, the Plant Inspector should have a sample record showing and explaining the codes used to represent various information at each plant.

2-3.041 Digital Recorders

The quantities and other batch information shall be printed by a printing calculator on either a ticket or a continuous tape. The principal difference between these two methods is that the ticket is multi-copy form with preprinted serial numbers and the tape recordation has a batch identification number printed for each batch.

The digital recordation shall contain the following information:

1. Individual aggregate identification and quantity
2. Cementitious Materials identification and quantity
3. Water quantity (central mix plants)
4. Admixture identification and quantity
5. Time and date of batch
6. Mix identification

7. Batch number (ticket serial numbers)

8. Out of tolerance indications for all materials batched or mixed outside the specifications.

When the printed digital record is used as, or part of, the delivery ticket, the Producer shall provide the State with two copies. One copy to go with the truck, the other for the Plant Inspector.

Figure 4 shows an example of a batch recordation print with the required indications.

**R. U. REALE READY-MIX Inc.** Ser. No.90125

| DATE | BATCH |
|---|---|
| 02/01/2001 | 00313 |

DESCRIPTION: CLASS HP NYSDOT D289190 RTE 66 / CRIPPLE CREEK

7.65 $m^3$ SIMULATED BATCH REPRINT

| MATERIAL | ACTUAL | TARGET | %TOL | % MOIST. | START TARE | END TARE |
|---|---|---|---|---|---|---|
| 1 STONE | 4600 KG | 4590 KG | 0.2 | 0.00 | AGG 30 * | 0 KG |
| SAND | 9520 KG | 9380 KG | 1.5 | 4.30 | CEM 15 * | 0 KG |
| 2 STONE | 14120 KG | 13970 KG | 1.1 | 0.00 | | |
| TYPE1 | 2300 KG | 2296 KG | 0.2 | | | |
| FLYASH | 2908 KG | 2908 KG | 0.0 | | | |
| M'SILICA | 3100 KG | 3100 KG | 0.0 | | | |
| WATER | 877 L | 873 L | 0.4 | | | |
| AEA | 1776 mL | 1665 mL | - 4.8 * | | | |
| RETARDER | 5328 mL | 5328 mL | 0.0 | | | |
| REDUCER | 5180 mL | 5209 mL | 1.0 | | | |

BOTTLE 1 NOT EMPTY !!

MIXED 60 OF 90 SECONDS FINISHED TIME: 02:21 PM

Figure 4

The resolution of the digital recorder shall be equal to or less than the scale graduations. The mass printed on the recordation shall agree within one scale graduation of the mass indicated on the primary scale display. A good time to check the recorder is when the mass tolerance interlock check is made.

2-3.05 Batching Inspection and Control

The Plant Inspector shall perform routine inspection during the batching of portland cement concrete mixture in the following manner:

1. Perform a fine aggregate moisture test, then direct the Plant Operator to set the proper moisture content in the batch set-up parameters before the production starts.

2. Check with the Plant Operator to see if the proper mix design is programmed, and all batching tolerances are set correctly.

3. Observe the automatic batching controls and recordation soon after production starts to see if they are working properly.

4. Spot check the recordation to see if the mass tolerance interlocks are working.

During production the Plant Inspector may encounter interruptions in the batching cycle, equipment breakdowns and malfunctions and situations where the Plant Operator by-passes a cycle interruption by manipulating controls on the panel. The Plant Inspector can handle some of the situations by the procedures described in the next subsections.

2-3.051 Batching Cycle Interruptions

When the automatic control interrupts the cycle because the batched quantity is outside the tolerance interlock settings, the Plant Inspector shall take the following action:

1. If the interlock settings are set less than the allowable batching tolerance range for the batch in question, the Inspector shall accept the batch and note the acceptance on the recordation of the batch.

2. If the interlock settings are set at the allowable batching tolerance for the batch in question, the Inspector may do one of the following and note it on the recordation:

   Aggregate "Overweight"

   Reject the batch unless the load requires two batches of which the second batch masses can be adjusted to compensate for the weighing error on the first batch.

   Cementitious Materials "Overweight"

   Reject batch or hold back extra cement upon discharge.

   Aggregate or Cementitious Materials "Underweight"

Add additional material by either automatic or manual cycle control.

Admixture Under Tolerance

Add additional material by either automatic or manual cycle control.

Admixture Over Tolerance

Reject the batch, or notify Project Engineer ( Air content testing per MM 9.2 may be performed to determine the acceptability of a load with excessive Entraining Agent).

If the automatic batching cycle is frequently interrupted when the mass tolerance interlocks are fixed for the minimum allowable batch masses, the Plant Inspector should notify the Regional Materials Engineer. The Materials Engineer may increase the minimum batch masses and consequently, the minimum tolerance range, or increase the tolerance settings to meet Department requirements. See Section 2-3.06- Minimum Batch Size for the computations.

2-3.052 Equipment Malfunctions and Breakdowns

When a breakdown in the automation and/or recordation occurs, the Plant Inspector shall notify the Regional Materials Engineer. If the concrete production is interrupted or the quality of the concrete is affected by the breakdown, the Plant Inspector shall also notify the Project engineer. The Materials Engineer may allow the Producer to batch and mix concrete mixtures for a period not exceeding 48 hours from the time of breakdown providing that acceptable concrete can be produced and recorded automatically or manually. The 48 hours are two consecutive calendar days (excluding Sundays and New York State legal holidays). Written permission of the Regional Director will be required for the Producer to operate without these instruments for periods longer than 48 hours.

When only portions of the batching or recordation equipment will not operate properly, it is the Inspector's responsibility to determine the seriousness of the trouble. It may be possible for the Producer to correct the problem without having to enter the 48 hour breakdown period. Some of the problems that may occur and action that an Inspector can take immediately are as follows:

| | Problem | Suggested Action |
|---|---|---|
| 1. | Draw masses incorrect | Check formula settings |
| 2. | Draw masses incorrect, formula setting correct | Check scales for binding |
| 3. | Draw masses out of tolerance, batching not automatically stopped by interlocks | Stop production, check tolerance and interlock settings |
| 4. | Draw masses in tolerance batching stopped frequently by interlocks | Check interlock settings |

| | | |
|---|---|---|
| 5. | Scale display not returning within zero tolerance and batching continues | Stop production, check zero tolerance and interlock setting, check for material caught in weigh hopper |
| 6. | Scale display returns to zero, batching stopped by zero interlock | Check zero tolerance and interlock setting |
| 7. | Mechanical or electrical equipment malfunction or failure | Stop production, notify producer and attempt to determine the cause of the malfunction or failure. Notify Materials Engineer |

2-3.053 Department Seal Control

An automated concrete batching plant with interlock controls in proper operation will cause an interruption in the cycle whenever an error in batching occurs. Since a stoppage can be by-passed on most plants by manipulation of different controls or switches found on the panel, it is the responsibility of the Regional Materials Engineer and the Plant Inspector to insure that the interlock system will not be by-passed without the knowledge of the Inspector. The Materials Engineer may require Department seals to insure that the interlocks are not being by-passed.

When seals are used, they shall be broken only in the presence of the Plant Inspector. In some instances however, the Producer may need to break a seal in the Inspector's absence. Any production that occurs after a Department seal has been broken without the knowledge and/or consent of the Inspector, is considered unacceptable until the Inspector verifies the acceptability of the material produced. The Inspector will verify the material's acceptability by reviewing the recordation of all batches produced during this period.

When digital display systems are used, the displays shall be covered so that the scales cannot be easily manipulated.

2-3.06 Minimum Batch Size

The accuracy of the batching control equipment generally governs what the minimum batch masses are. The minimum batch size for any plant is based upon the smallest masses that can be accurately batched for aggregate and cementitious materials. The accuracy of whichever scale that gives the <u>largest</u> minimum batch masses shall be used to determine the minimum batch size for the plant. For normal operations, the control equipment shall be considered accurate to no less than two (2) scale gradations. This is to prevent frequent interruptions in the cycle during operation.

The method for determining minimum batch masses and subsequent minimum batch size are described by the following example:

Minimum Batch Masses:

| | |
|---|---|
| Typical plant: | 7.5 Cubic Meter batch plant. |
| Aggregate Scale: | 20,000 kg using 20 kg increments. |
| Cement Scale: | 5,000 kg using 5 kg increments. |

Minimum Batch masses are determined by allowing 2 graduations for each specific scale, divided by the materials batching tolerance.

AGGREGATE MINIMUM BATCH WEIGHT= (Scale grad. x 2)/ .02
Example: (scale grad = 10 kg.) (10)(2)/.02= 1000 kg

CEMENT MINIMUM BATCH WEIGHT= (Scale grad. x 2)/ .01
Example: (scale grad = 2 kg.) (2)(2)/ .01= 400 kg

Minimum Batch Size:

Minimum batch size is determined by using the calculated minimum batch mass and dividing by an assumed concrete batch of 1800 kg of aggregate and 360 kg of cement per cubic meter respectively.

Aggregate: $\dfrac{\text{1000 kg (minimum calculated batch mass)}}{\text{1800 kg (average mass of aggregate per m}^3\text{)}} = 0.56\ m^3$

Cement: $\dfrac{\text{400 kg (minimum calculated batch mass)}}{\text{360 kg (average mass of cement per m}^3\text{)}} = 1.11\ m^3$

In this case the minimum batch size is determined by the cement and would be rounded to the nearest acceptable nominal size* ( ie. 1.25 $m^3$).

*An automation system may be allowed to produce to 0.1 $m^3$ increments (ie 1.2 $m^3$) if the system is capable of displaying and printing:

- The individual ingredient target masses
- Each actual mass
- Each variation from each target mass (by % or mass)

Or:

- The individual ingredient target masses
- Each actual mass with the high and low tolerance limits

The minimum batch masses are determined by the Materials Bureau personnel at the time of the automation equipment inspection. These minimum batch masses are stated in the approval memo sent to the Regional Materials Engineer. If the Regional Materials Engineer finds that the cycle is frequently interrupted during the operation with the minimum batch masses based upon the 2 gradation accuracy. The scale graduations should be increased, and new minimum batch masses should be calculated.

2-3.07 Manual (Non-Automated) Proportioning

Plants that are approved to produce during a period of "Failure of Automatic Batching" as described in Section 501-3.02 of the Standard Specifications shall operate within the batching tolerances given in that section. Batches produced outside these tolerances shall be either corrected or discarded. The Inspector shall spot-check the batching operations.

The batching controls shall be interlocked as follows:

1. The batching inlet gates cannot be opened while the weigh hopper discharge gates are open.

2. The batching discharge gates cannot be opened:

   - until the full batch masses are registered on the scales

   - while the weigh hopper is filled.

   - if the batch masses are over or under the specified batching tolerance.

3. A new batch cannot be weighed until the hopper is entirely empty of the previous batch and all scales have returned to within the allowable zero tolerance range.

The Plant Inspector shall periodically check the above noted interlocks to determine if they are working properly. The same inspection procedure described in Section 2-3.034, Batching Interlocks can be used.

In addition to the interlocks on the batching controls, the manual plant shall be equipped with a moisture meter as described in Section 2-3.02, Moisture Meter. The operation of the moisture meter shall also be the same.

2-4 MIXERS AND HAUL UNITS

Portland cement concrete is delivered to the project and point of deposition in approved mixing or haul units. The following describes the concrete mixing and delivery systems normally used on Department Projects:

1. Transit Mixed Concrete

   This is defined as concrete mixed at the plant or in transit to the project in a truck mixer. The cement, aggregates, admixtures, and water are batched at the concrete plant and mixing commences shortly after batching. Some additional mixing water and/ or water reducing admixture may be required at the placement site in order to achieve the proper consistency (slump). All additions at the placement site must be done in accordance with the requirements of Section 501 of the Standard Specifications.

2. Truck Mixed Concrete

   This is defined as concrete mixed on the project in a truck mixer. The cement, aggregates and admixtures are batched at a plant and hauled to the project in a truck mixer. Mixing water is from a tank on the truck and all mixing is accomplished at the placement site. Allowable haul time varies depending upon the method of batching used at the plant.

3. Central Mixed Concrete

This is defined as concrete mixed completely in a stationary mixer at the concrete plant. The mixed concrete is hauled to the project in either truck mixers or open haul units. When truck mixers are used, the drum revolves at agitating speeds while enroute to the placement site. Allowable haul time varies with the type of haul equipment used.

A summary of the Standard Specifications on concrete batching, mixing, hauling and discharging are given in Table 1. Any modifications to these specifications will be located in the project contract proposal.

## SUMMARY OF CONCRETE BATCHING, MIXING, HAULING AND DISCHARGING

| Central Mixed Concrete | Transit Mixed Concrete | Truck Mixed Concrete | |
|---|---|---|---|
| | | **REGULAR MIX** | **LAYERED MIX** |
| **Begin Batching**<br>Load mixer<br>**End of Batching and Begin Mixing**<br>90 Second minimum after all materials are in the mixer.<br>**End of Mixing**<br>**Open Haul Units**: 30 Minutes maximum<br>**Rotating Drum**: Agitate 2-6 rpm; 90 Minutes maximum (See Note 2)<br>**Completion of Discharge**<br>(When concrete is transported in units approved for mixing see Note 1) | **Begin Batching**<br>Hatch load, or ribbon load materials through barrel hopper.<br>Add approx. 90% of design water<br>**Cement In Contact With Aggregates**<br>5 Minutes max.<br>**Begin Mixing**<br>at plant or in transit<br><u>**Class HP or Class DP**</u><br>100 rev. minimum<br>200 rev. maximum<br>Mix: 6-18 rpm<br><u>**All Other Classes**</u><br>100 rev. minimum<br>160 rev. maximum<br>Mix: 6-18 rpm<br>**End of Mixing**<br>Agitate 2-6 rpm<br>**Begin Discharge**<br>50 Minutes maximum<br>**Completion of Discharge**<br>(Cement In Contact With Aggregates to Completion of Discharge: 90 Minutes max. (See Note 2)) | **Begin Batching**<br>Load aggregates. Drum may be rocked or revolved<br>**Load Cement**<br>(See Note 3)<br>**Cement In Contact With Aggregates**<br>30 Minutes max. | **Begin Batching**<br>Load fine agg. , then SSD coarse agg. through hatch. Drum may be rocked.<br>**Load Cement**<br>(See Note 3)<br>**Cement In Contact With Aggregates**<br>90 Minutes max. |
| | | **Begin Mixing**<br>At project, after adding water<br>Mix: 6-18 rpm<br>100 rev. minimum<br>160 rev. maximum<br>15 Minutes maximum<br>**End of Mixing**<br>Agitate 2-6 rpm<br>30 Minutes maximum<br>**Completion of Discharge** | |

**Note 1:** The remainder of the design water may be added at the work site to attain initial slump. When approved by the Regional Materials Engineer, only the first trucks may be adjusted to obtain initial slump using a water- reducing admixture (§711-08, ASTM Type A) . Exceeding the maximum mixing revolutions or water addition requirements will not be permitted.

**Note 2:** For mixtures that do not contain a water-reducing and retarding admixture (§711-08, ASTM Type D), the 90 minute maximum time includes the time to initial strike- off, or placement of subsequent lifts.

**Note 3:** Add cement through hatch. Do not move drum while cement is being added.

TABLE 1

2-4.01 Concrete Mixing and Hauling Units Inspection

Prior to use for Department work, the Inspector shall inspect the operating condition of the mixing and hauling equipment for conformance with Section 501 of the Standard Specifications. The Inspector will notify the Producer of the required inspection procedures so that the Producer may prepare the delivery units for the inspection. All pertinent safety procedures required by OSHA shall be observed to protect the Inspector while the inspections are being performed. The Plant Inspector shall notify the Producer and the Regional Materials Engineer of any deficiencies in the equipment so it is repaired before further use for Department work.
The Plant Inspector shall obtain the mixer charging or loading sequence from the Regional Materials Engineer. During production, he shall periodically check the batching operation to be sure that the proper charging sequence is followed.

2-4.011 Transit Mixed Concrete

The Plant Inspector shall inspect the transit truck mixer to see if it has a current inspection seal (BR-275). The inspection seal gives the allowable mixer capacity and the mixing speeds. The transit truck mixer shall also have an electric counting device which shows drum revolutions within the specified mixing range and total drum revolutions. The Revolution counter shall be one that appears on the Department's Approved List issued by the Materials Bureau. The electric revolution counting device shall be reset to zero by the Producer at the time of loading. The Plant Inspector shall periodically inspect the working condition of the revolution counter.

2-4.011 Truck Mixed Concrete

The Plant Inspector shall inspect the truck mixer to see if it has a current inspection seal (BR-275 - Approved Concrete Mixing/Delivery Unit). The inspection seal gives the allowable mixer capacity and the mixing speeds. The truck mixer shall also have a counting device which, as a minimum, shows total drum revolutions in the direction of mixing. The revolution counting device shall be reset to zero by the Producer at the time of loading. The plant Inspector shall periodically inspect the working condition of the revolution counter.

2-4.013 Central Mixed Concrete

The central mixer is approved as part of the batching equipment. The standard mixing time given in Table 1 of this manual shall apply except for the case where a reduced mixing time has been granted by the Department. The reduced mixing time is based on the results of a "mixer efficiency test" performed according to the procedures given in Appendix H., Uniformity Test Procedure. The Plant Inspector shall periodically inspect the length of mix time.

The central mixed concrete shall be delivered to the placement site in either open haul units (with or without rotating paddles) or rotating drum units. Open haul units shall be considered acceptable by the Plant Inspector when the truck bodies are smooth and free of any concrete build-up. No inspection seals are required. The rotating drum units shall meet the requirements of either transit or truck mixed concrete. When concrete is delivered in either transit or truck mixers, mixing water may be added at the placement site. For this situation, the Plant Inspector shall insure that at least 90% of the design mixing water is used at the central mixer.

INSPECTOR'S CHECKLIST

Materials

1. Do you have an aggregate certification from the Producer showing all the required information?

2. Are the aggregate stockpiles identifiable and separated by sizes?

3. Have you performed tests on the aggregates
   - before production starts?
   - before starting after a shutdown?

4. Do the aggregates in the stockpile compare favorably to the reference sample by visual identification?

5. Do you understand the gradation control procedure depicted in Figures 1 and 2?

6. Have you checked the Approved Products Listing to see if the cement and admixtures are approved?

7. Do you know where the water is coming from?

8. Have you tested the microsilica for contamination using the procedure in Appendix I?

Batching

9. Have you checked with the Materials Engineer to find out if the plant equipment has limitations?

10. Have the scales and meters been tested for accuracy recently?

11. Does the moisture meter work?

12. Are the design masses properly programmed into the automated batching system?

13. Does the moisture compensation device, if any, work properly?

14. Do you know what the batching tolerances are?

15. Are the weighing tolerance interlocks set and working properly?

16. Do you know what to do when a material mass is outside the interlock settings and the cycle is interrupted?

17. Do you know what the plant's minimum batch weights are?

INSPECTORS' CHECKLIST (cont.)

18. Do you know the codes or symbols for "out of tolerance" etc., on the recordation?

19. Do you know that the weighing tolerance interlocks set in the automation system may be set for less than the allowable tolerances for some batch sizes? This may result in "out of tolerance indications" on the recordation that may actually represent acceptable batch masses.

20. Do you know what information is required on the recordation?

21. Do you know what a breakdown is and when the 48 hour breakdown period begins and ends.

Mixing

22. Have you checked the condition of the blades in the mixing drums?

23. Do you know the mixer charging or loading sequence?

24. Do transit or truck mixers have current inspection seals?

25. Do the revolution counters work properly on transit or truck mixers?

26. Do the revolution counters appear on the Department's Approved List?

27. Do you know what the mixing time is for the central mixer and have you checked it?

28. Do you approve of the condition of the open haul units?

29. Have you checked to see that prior to loading of the constituents of the concrete mixture that the truck mixers or open haul units have been drained of wash water?

# SECTION 3

## ADMINISTRATIVE PROCEDURES AND RECORD KEEPING

### 3-1 GENERAL

The Plant Inspector is responsible for maintaining a diary, test records, production records and issuing acceptances of concrete production to projects. These records along with the material certifications and mix designs shall be kept on file at the plant in an orderly manner so they can be readily consulted. The diary shall be used to record miscellaneous test data and information and also to record conversations between the Plant Inspector and Producer.

For administrative purposes, concrete plants shall be in one of the two categories that follow:

1. Project Plant - A plant located on the project site for the purpose of serving the <u>one</u> project.

2. Non-Project Plant - A plant located off the project site. These are usually commercial plants capable of serving more than one project at a time.

### 3-2 DELIVERY TICKETS

Each vehicle delivering portland cement concrete or its ingredients to a project shall be accompanied by a delivery ticket prepared by the Producer.

The following minimum information shall be included on delivery tickets:

1. Delivery ticket number

2. Plant identification

3. Contract number

4. Concrete class or item number

5. Quantity (Nominal batch size)

6. Truck number

7. Batch number

8. An automatically applied time - date stamp which may consist of one of the following:

   a. Time - date stamp by printing device on a regular ticket (when no recorded batch masses accompany the load).
   b. Time - date printed by a batch mass recorder on a printed ticket.
   c. Time - date printed by a batch mass recorder on a printed tape. A copy of the tape shall be affixed to the regular delivery ticket.

The Plant Inspector shall review delivery tickets at least three (3) times per day for each project served to ascertain that they contain the proper information. The Inspector shall write the remark "Delivery Ticket OK" followed by his signature on each ticket reviewed.

## 3-3 PRODUCTION RECORDS

The acceptability of portland cement concrete dispatched from the plant is based on evidence that the materials used in the mix were approved and that they were properly proportioned. The quantity of acceptable concrete is determined from records containing this information.

### 3-3.01 Materials Acceptance Records

The records that the Plant Inspector shall keep on file at the plant during production relating to material acceptance are as follows:

1. Aggregate certifications
2. Cement, pozzolans, and/or microsilica shipment certifications or authorizations
3. Aggregate test results
4. Diary (admixtures and water source)

The aggregate certifications and cement shipment certifications along with the mix designs shall be ultimately incorporated into project files in the case of project plants. For non-project plants, all acceptance documents shall be maintained in the plant records.

#### 3-3.011 Batch Recordation

Recordation may be filed with plant records or may be filed with delivery tickets in project files, depending upon the system in use. One of the following procedures shall be followed:

| | Type Recordation | Disposition |
|---|---|---|
| 1. | Printed delivery ticket | Collected by the Project Inspector. Filed at project. |
| 2. | Printed tape | Collected daily by Plant Inspector. Filed at plant. |
| 3. | Printed tape affixed to delivery ticket | Collected by Project Inspector. Filed at project. |

The adoption of either of the above procedures shall be based on an agreement between the Regional Materials Engineer, Project Engineer and the Producer.

## 3-4 CONCRETE ACCEPTANCE REPORT

A concrete acceptance report (BR-316a, Daily Concrete Batch Plant Report) for concrete produced and authorized to be shipped to each project shall be completed by the Plant Inspector at the end of the day. Inspectors at project plants shall give the report to the Project Engineer at the end of the day. Inspectors at non-project plants shall issue a copy of the report to each project served by the plant and retain the original for the plant records. The report shall be forwarded to the projects not later than the morning following the report date.

The reports shall be numbered consecutively by the Plant Inspector with Report 1 beginning on the first production day of any calendar year. The job stamp shall be applied at the project. A sample copy of the report is shown in Figure 5.

### 3-4.01 Quantity Determination

The Plant Inspector shall determine the acceptable quantity of concrete for each project by reviewing the production records. Acceptable concrete batches are batches that are made with acceptable materials and properly proportioned. A properly proportioned batch is one in which the material quantities are within allowable batching tolerances.

At the end of each working day, the Plant Inspector shall review the batch recordation and identify the class and count the number of acceptable batches dispatched to each project. In some cases the Plant Inspector may have permitted a batch mass to be corrected during production. These batches are acceptable providing that the recordation is so noted by the Inspector at the time the correction is made. The acceptable quantity shall be the number of batches multiplied by the appropriate batch sizes.

When a plant is finishing a placement in the Phase III condition due to aggregate gradation being out of specifications, the Plant Inspector shall note the quantities under "Remarks" in the report for each project affected. These quantities shall be included in the total amount of "Authorized Shipments".

The concrete shall be identified on the report by class when a standard class of concrete is used. If the concrete is not a standard class, the concrete shall be identified by pay item number.

BR 316a (3/98)

NEW YORK STATE
DEPARTMENT OF TRANSPORTATION

## DAILY CONCRETE BATCH PLANT REPORT

SHEET 1 OF 1

| REPORT NO. | DATE | REGION | FACILITY NO. |
|---|---|---|---|
| 1 | 3/13/01 | 5 | 20621 |

PLANT: R.U. REALE

LOCATION: STAFFORD BRIDGE N.Y.

MIXER TYPE: ☒ TRANSIT ☐ TRUCK ☐ CENTRAL ☐ DRY

JOB STAMP

| MATERIAL | ITEM | CODE | TYPE | SOURCE (Brand name, Manufacturer location) |
|---|---|---|---|---|
| CEMENT AND / OR POZZOLAN(s) | C1 | 35 | I | LAFARGE CANADA INC., BATH, ONTARIO |
| | C2 | 08 | FLYASH | CRANESVILLE MAT'LS, EASTLAKE, OHIO |
| | C3 | 6002 | MICROSILICA | W.R. GRACE, NIAGARA FALLS, N.Y. |
| | C4 | | | |
| ADMIXTURES | M1 | 1026 | Air Entrainer | SIKA AEA-15 |
| | M2 | 3015 | Water Reducer | SIKA PLASTIMENT N.S. |
| | M3 | 2017 | Retarder | SIKA PLASTOCRETE 161R |
| | M4 | | | |
| | M5 | | | |
| AGGREGATE | ITEM | SOURCE NO. | | SOURCE (Company name, Source location) |
| FINE | A1 | 5-39F | | GERNATT ASPHALT PRODS, SANDUSKY, N.Y. |
| COARSE | A2 | 5-1R | | BUFFALO CR. STONE, CHEEKTOWAGA, N.Y. |
| COARSE | A3 | | | |
| OTHER | A4 | | | |

WATER SUPPLY: ☐ MUNICIPAL ☒ WELL ☐ POND ☐ STREAM ☐ OTHER (explain)

### AUTHORIZED SHIPMENTS

| PROJECT | CLASS | QUANTITY | MATERIALS USED IN CONCRETE (check appropriate items) | | |
|---|---|---|---|---|---|
| D252019 | HP | 250 CM | ☒ C1 ☒ C2 ☒ C3 ☐ C4 | ☒ M1 ☒ M2 ☒ M3 ☐ M4 ☐ M5 | ☒ A1 ☒ A2 ☐ A3 ☐ A4 |
| D253221 | A | 75 CM | ☒ C1 ☐ C2 ☒ C3 ☐ C4 | ☒ M1 ☒ M2 ☐ M3 ☐ M4 ☐ M5 | ☒ A1 ☒ A2 ☐ A3 ☐ A4 |
| | | | ☐ C1 ☐ C2 ☐ C3 ☐ C4 | ☐ M1 ☐ M2 ☐ M3 ☐ M4 ☐ M5 | ☐ A1 ☐ A2 ☐ A3 ☐ A4 |
| | | | ☐ C1 ☐ C2 ☐ C3 ☐ C4 | ☐ M1 ☐ M2 ☐ M3 ☐ M4 ☐ M5 | ☐ A1 ☐ A2 ☐ A3 ☐ A4 |
| | | | ☐ C1 ☐ C2 ☐ C3 ☐ C4 | ☐ M1 ☐ M2 ☐ M3 ☐ M4 ☐ M5 | ☐ A1 ☐ A2 ☐ A3 ☐ A4 |
| | | | ☐ C1 ☐ C2 ☐ C3 ☐ C4 | ☐ M1 ☐ M2 ☐ M3 ☐ M4 ☐ M5 | ☐ A1 ☐ A2 ☐ A3 ☐ A4 |
| | | | ☐ C1 ☐ C2 ☐ C3 ☐ C4 | ☐ M1 ☐ M2 ☐ M3 ☐ M4 ☐ M5 | ☐ A1 ☐ A2 ☐ A3 ☐ A4 |
| | | | ☐ C1 ☐ C2 ☐ C3 ☐ C4 | ☐ M1 ☐ M2 ☐ M3 ☐ M4 ☐ M5 | ☐ A1 ☐ A2 ☐ A3 ☐ A4 |

REMARKS: D252019: 50/50 SPLIT OF WATER REDUCER & W.R./RETARDER USED.

| PLANT INSPECTOR (signature) | PROJECT REVIEWER (signature) |
|---|---|
| Joseph Bushey | Alex P. Keaton - E.I.C. |

Figure 5

## 3-5 ACCEPTANCE OF SMALL QUANTITIES BY PRODUCER'S CERTIFICATION

When it is not feasible to provide plant inspection for small quantities (up to 20 cubic meters), the Regional Materials Engineer and Project Engineer may agree to accept the concrete from an approved plant on the basis of a Producer's certification stating that the concrete conforms to specification. The certification shall be form BR-342 - Materials Certification, completed by the Producer as shown in Figure 6. The producer shall retain a legible copy of the delivery ticket for the Regional Materials Engineer. Also, recordation for each batch shall accompany the certification.

Small quantities of concrete may be certified for the following placements:

1. Sign foundations
2. Lighting structure foundation
3. Curbs
4. Gutters
5. Headwalls
6. Catchbasins
7. Manholes
8. Drop Inlets
9. Field Inlets
10. Concrete Riprap
11. Concrete Driveways
12. Other similar placements

BR 342 (01/2002)

NEW YORK STATE
DEPARTMENT OF TRANSPORTATION
**Portland Cement Concrete Materials Certification**

| SHIPPED FROM: | JOB STAMP |
|---|---|
| FACILITY NO.: *20261* | |
| Plant: *R.U. REALE* | |
| Location: *Stafford Bridge* | |
| Date Shipped: *09/11/01* | |

| SHIPPED TO: | Class/Mix Type* | Quantity |
|---|---|---|
| Project Number: *D259321* | *555.0104 (Class A)* | *10 cubic meters* |
| Location: *Rte 288 / Slug River* | | |
| | | |

*Use Item Number when material is not designated by Class/Mix Type.

I certify that the material delivered with the delivery ticket to the above noted project was proportioned in accordance with the requirement of the contract specifications for the specific Class/Mix/Item noted using New York State Department of Transportation approved materials

| BY: *Robert P. Harty* | CERTIFICATION APPROVED |
|---|---|
| TITLE: *Plant Superintendent* | REGIONAL MATERIALS ENGINEER |
| DATE: *05/18/01* | BY: *Chip Mulligan - Region 12* |

| CEMENT BRAND NAME & LOCATION: | |
|---|---|
| CEMENT TYPE: ( 1 ) ( 2 ) ( 3 ) ( 4 ) ( 5 ) ( 6 )( other ) *Lafarge, Canada* | CODE NUMBER: *35* |
| OTHER: *Flyash -Cranesville Materials, Eastlake , Ohio* | CODE NUMBER: *08* |

**ADMIXTURES:**

| | |
|---|---|
| AIR AGENT: *Sika AEA* | CODE NUMBER: *1026* |
| RETARDER: *Sika Plastiment NS* | CODE NUMBER: *3015* |
| WATER REDUCER: | CODE NUMBER: |
| OTHER: | CODE NUMBER: |
| OTHER: | CODE NUMBER: |
| OTHER: | CODE NUMBER: |
| F.A. SOURCE NUMBER: *5-39 F* | C.A. SOURCE NUMBER: *5-1R* |
| F.A. SOURCE NUMBER: | C.A. SOURCE NUMBER: |
| DELIVERY TICKET NUMBER: *66969* | |
| REMARKS: | |

Figure 6

INSPECTOR'S CHECKLIST

1. Are your daily records neat, legible and properly filed?

2. Are you spot checking the delivery tickets to determine if they contain the proper information?

3. Do you know what an acceptable batch of concrete is?

4. Have you reviewed the batch recordations and identified the batches according to class and project destination?

5. Does the quantity listed under authorized shipment on form BR-316a represent only acceptable batches?

6. Have you noted under "Remarks" on form BR-316a the quantity of any concrete produced under the Phase III condition?

# SECTION 4

# PLANT AND MIXER APPROVALS

## 4-1 GENERAL

The concrete batching plant, including the testing facility and truck mixers shall be inspected and approved by the Department before production begins and then annually thereafter while the plant remains in the same location. The Regional Materials Engineer may require these annual inspections to take place prior to the construction season. The approvals shall be granted to the Producer upon compliance with the specifications. The approval procedures are described in this section.

The Regional Director may at any time, discontinue the use of any previously approved equipment, if non-conformance with the specifications result during the progress of the work. When the Regional Director discontinues the approval, the equipment will not be acceptable for Department work until corrections are made by the Producer.

## 4-2 PLANT APPROVAL

The plant inspection shall be performed by the Regional Materials Engineer or his representative. The requirements for the plant and testing facility are given in Section 501 of the General Specifications.

The inspection results shall be recorded on Form BR-180, Annual Inspection Record - Portland Cement Concrete Batch Plant. An example of a completed inspection form is given in Appendix J. A copy of the form shall be submitted to the Materials Bureau for review. Plants found acceptable in the review will be approved by the Director of the Materials Bureau. Upon approval, one copy of the report stating limitations, if any, will be returned to the Region Office.

### 4-2.01 Automatic Batching Controls

The automatic batching and recording equipment shall be inspected by personnel from the Materials Bureau after the equipment is installed, but before the plant produces concrete for Department work. At the time of the inspection the Producer shall have a person capable of making adjustments to the automatic controls. This would normally be a manufacturer's technical representative of the automation company. A representative of each Admixture company's system should also be available to make adjustments and /or electrical connections to the dispensing system during the inspection.

After the automatic batching and recording equipment is found acceptable, the automation system will be approved in writing by the Director of the Materials Bureau.

After the initial inspection, further inspections are made by the Materials Bureau when:

1. Major changes are made in the scales, batching controls, admixture dispensing systems, or recorder. Major changes include, but are not limited to:
   - changes in the automation system's hardware or software that effects how the system proportions ingredients relative to the Standard Specifications.

- changes to the plant's configuration (one stop vs. two stop; new admixture dispensing system, new plant using existing automation, etc.).
- change of plant location from one region to another.

2. Request for reduced mixing time for central mix facilities, or any other special request by the Regional Materials Engineer.

An example of a typical annual automation inspection test is given in Figure 8. Also, refer to Appendix J for an example of an annual plant inspection Record (BR- 180).

## 4-3 TRUCK MIXERS

An annual inspection of all truck mixers used for Department work during the construction season shall be made by the Regional Materials Engineer. The mixer shall meet the requirements given in Section 501 of the General Specifications and shall be properly identified with the Producer's company name and a truck number.

If the requirements are met, the Materials Engineer shall affix an inspection seal (BR-275 Approved Concrete Mixing/Delivery Unit) in a visible place within the truck cab. An example of the inspection seal is given in Figure 7. An example of a typical annual truck inspection sheet is given in Figure 9.

Any time that an approval is discontinued, the inspection seal shall be removed and replaced only after repairs are made by the Producer.

NYS Department of Transportation
APPROVED CONCRETE
MIXING / DELIVERY UNIT

**2001**

Truck Number 34

Mixing Capacity 6.12 c.m. (8 c.y.)

Agitating or Delivery Capacity 7.65 c.m. (10 c.y.)

Mixing Speed 6-12 RPM

Agitating Speed 2-6 RPM

Approved by Joseph Buckley

BR 278v (11/00)

Figure 7

STATE OF NEW YORK
DEPARTMENT OF TRANSPORTATION
REGION 10
ANNUAL AUTOMATION TEST

PLANT/LOCATION BRIDGEPORT CODE 20999

DATE 7/15/01 INSP JERRY EUBANKS

AUTOMATION MAKE ALKONSO PRINTER OKIDOKI

TEST # 1 5.0 CY/CM % MOISTURE 4.6 ZERO: CEM 4kg AGG 20kg

| AGG # (2) | PROGRAM | TEST |
|---|---|---|
| SAND WGT & MOISTURE | 3138 | 3140 ok |

TEST # 2 7.65 CY/CM % MOISTURE 5.1

| AGG # (2) | PROGRAM | TEST |
|---|---|---|
| SAND WGT & MOISTURE | 4824 | 4820 ok |

TEST # 3 3.0 CY/CM % MOISTURE 4.2 TWO (2) ADMIXES ____

| STEP | UW TOL | UW TEST | PROGRAM | OW TEST | OW TOL |
|---|---|---|---|---|---|
| AGG 1 | 1764 | 1760 | 1800 | 1840 | 1836 |
| AGG 2 | 3602 | 3600 | 3676 | 3750 | 3749 |
| AGG 3 | 5366 | 5360 | 5476 | 5590 | 5585 |
| CEM 1 | 895 | 894 | 900 | 906 | 904 |
| POZZ 1 | 1134 | 1132 | 1140 | 1148 | 1146 |
| POZZ 2 | 1209 | 1208 | 1215 | 1222 | 1221 |

HARD COPY YES/NO FORMULA # NYHPTEST

NOTE: IF ANY CEMENT IS ON A SCREW, TURN OFF ELECTRIC

REMARKS
TOLERENCES SET TO 2% OF ACUMULATED AGG WTS.
" " " 0.5% " " CEM/POZZ WTS.

Figure 8

R10: TMI (12/97)

# NEW YORK STATE
# DEPARTMENT OF TRANSPORTATION
# CONCRETE TRUCK MIXER INSPECTION

YEAR: 2001

COMPANY: J.W. HAWKINS INSPECTOR: J. EUBANKS

| TRUCK NO. | BLADES | WATER SYSTEM | PLATE | | COUNTER | | DATE TAGGED | MIX TYPE | REMARKS |
|---|---|---|---|---|---|---|---|---|---|
| | | | MIX | AGIT. | TYPE | COND | | | |
| 6 | ✓ | ✓ | 9cy 6.9cm | 12cy 9.2cm | ELEC. DUAL | OK | 6/22/01 | ALL | |
| 14 | ✓ | ✓ | " | " | " | OK | " | " | |
| 25 | ✓ | ✓ | " | " | " | OK | " | " | |
| 8 | ✓ | ✓ | " | " | " | OK | " | " | |
| 90 | ✓ | ✓ | " | " | " | OK | " | " | |
| 36 | ✓ | ✓ | " | " | " | OK | " | " | |
| 40 | N.G. | ✓ | " | " | " | N.G. | | — | WORN BLADES, COUNTER BROKEN 6/22/01 |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |

**INSTRUCTION** :

BLADES: At least 80% of original blade area usable.
WATER SYSTEM: Accurate gauge, no leaks.
RATING PLATE: Enter rated capacities for mixing and agitating.
COUNTER: Enter type (dual or single) and condition.
TAGGED: Enter date tagged. If not tagged, leave this column blank and enter date and reason in remarks column.
MIX TYPE: Enter "ALL" if approved with dual readout counter or "NO TRANSIT" if approved with single readout counter.

**NOTE:**
1. Do not enter location of truck mixers.
2. All mixers; mixing speed 6 to 18 RPM.
agitating speed 2 to 6 RPM.

Figure 9

# APPENDICES

# APPENDIX A

## SAMPLING OF AGGREGATES

### A. SCOPE

This method prescribes procedures for obtaining and preparing a sample of aggregate that represents the material being used in the concrete.

### B. GENERAL

The Regional Materials Engineer shall choose one of the sampling points given below for each plant. In choosing the sampling point, safety of the Plant Inspector shall be taken into consideration. The Inspector shall take samples from the selected point according to these procedures.

### C. EQUIPMENT

The following equipment is generally used for sampling:

1. Pails
2. Square Shovel
3. Brushes (soft and coarse)
4. Sample Splitter with Pans

### D. SAMPLING PROCEDURES

1. <u>Stockpile Sampling</u>

   a. Conical Stockpiles

   The sample shall be composed of material representing at least nine (9) points in the stockpile. Samples shall be taken at third (1/3) points around the pile and at three (3) levels (base, middle, and top). At each point, the face shall be exposed to a minimum depth of 0.3 meters (1 ft.) before sampling. Care shall be taken so that aggregate adjacent to the sampling point does not fall into the sampling area.

   b. Other Stockpiles

   The details for conical stockpiles shall apply except that the sample shall be composed of material representing at least six (6) points in the area of the stockpile being used for production.

Samples shall be taken from two (2) locations in reference to the base and at three (3) levels, (base, middle, and top).

2. <u>Belt Sampling</u>

A portion of aggregate large enough to comprise the required sample size shall be removed from the stopped belt with a square shovel and placed in a sample container. Care shall be taken to remove all the material on the belt in the sampling area. A brush may be used to remove the fine material clinging to the belt.

3. <u>Bin Sampling</u>

Samples shall be obtained with a sampling device that allows the Inspector to obtain representative samples from the full width and depth of the discharge area from each bin while the plant is in operation. The device shall consist of a sampling tray of adequate capacity which is structurally supported during the sampling operation. A shovel is not satisfactory for this purpose.

## E. SAMPLE SIZE

The amount of aggregate required for a representative sample and the size of sample for testing are given in the respective test methods.

When a non-standard aggregate size is used, the sample size shall be that of the closest standard primary size.

## F. SAMPLE PREPARATION

In order to obtain a convenient sample size for sieving, or for other tests, a large bin, stockpile, or belt sample may be reduced by a sample splitter or by quartering. Any sample that has visible "free moisture" should be split by quartering.

When using a sample splitter, the original sample shall be split into two (2) fractions. If one of these fractions is too large for testing, a fraction can be split again. This splitting procedure can be used until the proper size sample for testing is achieved.

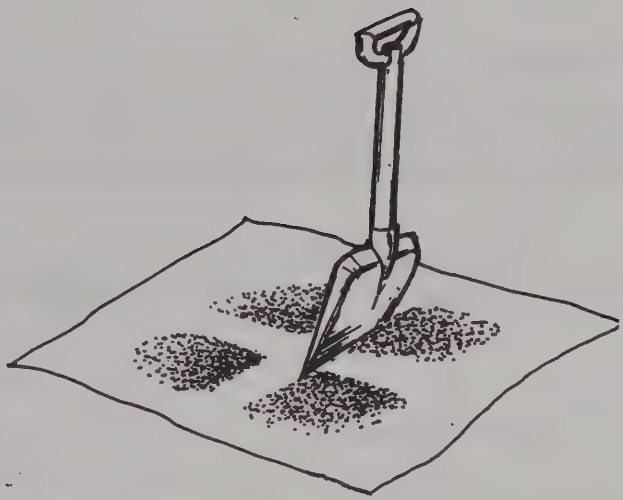
If a sample splitter is not available, the sample shall be reduced by quartering using the following method:

1. Distribute a shovelful of the aggregates as uniformly as possible over a wide, flat area on a tight weave canvas, or other smooth surface. Continue to distribute scoopfuls of aggregates in layers until all of the aggregate is used to make a wide, flat pile that is reasonably uniform in thickness and distribution of aggregate sizes. Do not permit coning of the aggregates.

2. Divide the sample into equal quarters with a square end shovel, trowel or straight piece of sheet metal. Discard two (2) opposite quarters and combine the remaining quarters taking care to include the dust and fines with each quarter. If necessary, this procedure is repeated until the sample size has been reduced sufficiently.

Figure A-1 illustrates both techniques for reducing the sample size.

Splitting a sample with a sample splitter



Quartering a sample with a square end shovel on a piece of canvas

Figure A-1

# APPENDIX B

## COARSE AGGREGATE GRADATION TEST

### A. SCOPE

This test method prescribes the procedures for determining the gradation of coarse aggregates for individual aggregate sizes and combined gradation when more than one aggregate size is used in the concrete.

### B. SAMPLE

The samples shall be obtained and reduced to testing size in accordance with Appendix A, Sampling of Aggregates. The quantity of material needed for testing is as follows:

| Aggregate Size | Original Sample (kg) Minimum | Test Sample (kg) Minimum |
|---|---|---|
| #3 | 80 | 20 |
| #2 | 40 | 10 |
| #1 & #2 BLEND | 40 | 10 |
| #1 | 20 | 10 |
| #1A | 10 | 5 |

### C. EQUIPMENT

The following equipment is required for the coarse aggregate gradation test:

1. Power driven coarse aggregate sieve shaker with appropriate sieves and timer
2. Large capacity scale (minimum of 14 kg capacity with 0.005 kg graduations max.)
3. Oven or hot plate
4. Pans
5. Brush
6. Stirring spoon

## D. TEST PROCEDURE

1. Dry the sample to a constant mass.

   NOTE: The Materials Engineer may permit the Plant Inspector to test the No. 3 and/or No. 2 size aggregate for gradation without drying the aggregate to a constant mass providing that the aggregate is relatively free of moisture. Indicate on the gradation form if the sample was not dried, i.e., "not dried".

2. Weigh the sample.

3. Sieve the sample using the sieve sizes for the particular aggregate for at least five (5) minutes. Do not combine different samples. Also, do not overload the sieves. As a guide, any sieve loaded with more than a single layer of aggregate at the end of the test is overloaded. When overloading occurs, sieve only portions of the sample at a time, and combine like sizes after sieving.

4. Weigh the material retained on each sieve and pan to the nearest 0.005 kilograms and record the retained masses. The total of the retained masses should agree closely with the original sample mass determined in Step 2.

## E. CALCULATIONS

The calculations needed to determine the coarse aggregate gradation are described by examples given below. Example 1 shows the calculation for the gradation of an individual aggregate size; Example 2 shows the calculations for determining the combined gradation when two aggregate sizes are used in the concrete mixture.

Example 1

A sample of No. 1 size aggregate has been sieved and the masses of retained material are as follows:

| Sieve | Mass Retained (kg) |
|---|---|
| 25 mm | 0 |
| 12.5 mm | 0.42 |
| 6.3 mm | 8.25 |
| Pan | 0.63 |
| TOTAL | 9.30 |

Step 1

The retained masses are expressed as percentages of the total mass:

$$12.5mm \ \% \ Ret. = \frac{0.42}{9.30} \times 100 = 4.5\%$$

$$6.3mm \ \% \ Ret. = \frac{8.25}{9.30} \times 100 = 88.7\%$$

$$PAN \ \% \ Ret. = \frac{0.63}{9.30} \times 100 = 6.8\%$$

Step 2

The gradation of the aggregate, in terms of percent passing each sieve are obtained by adding cumulatively, beginning with the smallest sieve.

% Pass. 6.3mm = 6.8%

% Pass. 12.5mm = 6.8 + 88.7 = 95.5%

% Pass. 25mm = 95.5 + 4.5 = 100.0%*

*May sometimes be only within one or two tenths of 100.0% due to rounding. Any rounding of masses retained to reach 100 % shall be done on the largest mass retained.

Example 2

Class A concrete is being produced with coarse aggregate from separate stockpiles for the No. 1 and No. 2 sizes. The gradations for the separate stockpiles were performed in the same manner as described in Example 1 and are as follows:

| | No. 1 | | | No. 2 | | |
|---|---|---|---|---|---|---|
| Sieve | Wt. Ret.(kg) | % Ret. | % Pass. | Wt. Ret.(kg) | % Ret. | % Pass. |
| 37.5 mm | | | | 0.00 | 0 | 100 |
| 25 mm | 0.00 | 0 | 100 | 0.795 | 7 | 93 |
| 12.5 mm | 0.905 | 10 | 90 | 10.09 | 89 | 4 |
| 6.3 mm | 7.25 | 80 | 10 | | | |
| Pan | 0.905 | 10 | | 0.455 | 4 | |
| Total | 9.06 | 100 | | 11.34 | 100 | |

Note: The percentages shown above are rounded to the nearest whole percent.

The batch masses for the coarse aggregate in a one cubic meter batch of concrete are as follows:

No. 1 460 kg

No. 2 460 kg

Determine the combined gradation for these two aggregates. Calculations for this example are also shown in Figure B-1.

Step 1

The batch masses of coarse aggregate are converted to percentages of the total coarse aggregate mass.

$$\% \, No.1 \; \frac{460}{460 + 460} \times 100 = 50.0\%$$

$$\% \, No.2 \; \frac{460}{460 + 460} \times 100 = 50.0\%$$

Step 2

The gradation for each coarse aggregate sieve (percent passing) is multiplied by the percentage of total coarse aggregate for the respective samples.

% Passing the 12.5 mm sieve in the No. 1 stockpile is 50 x 0.90 = 45.0%
% Passing the 12.5 mm sieve in the No. 2 stockpile is 50 x 0.04 = 2.0%
This calculation is repeated for each sieve size for both aggregates.

Step 3

The results obtained in Step 2 are added together for each sieve size to get the total percent passing for the combined gradation.

Total % Passing 12.5 mm sieve:

| | |
|---|---|
| No. 1 | 45.0% |
| No. 2 | 2.0% |
| Total | 47.0% |

## F. REPORT

The gradation test results shall be determined and reported on Form No. BR 317M, Aggregate Tests - Portland Cement Concrete Plant. Round off the percent passing results to the nearest whole percent.

## G. ACTION

The gradation test results shall be compared to the specification limits. The Plant Inspector shall take the appropriate action described in Section 2-2.015, Aggregate Gradation Control.

## COARSE AGGREGATE TESTS

### INDIVIDUAL SAMPLE GRADATION

| SIEVE SIZES (MM) | NO. 3 | | | | NO. 2 | | | | NO. 1 | | | | NO. 1 & NO. 2 (PREBLENDED) | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | WT. | PERCENT RET. | PERCENT PASS | SPEC. LIMITS | WT. | PERCENT RET. | PERCENT PASS | SPEC. LIMITS | WT. | PERCENT RET. | PERCENT PASS | SPEC. LIMITS | WT. | PERCENT RET. | PERCENT PASS | SPEC. LIMITS |
| 63.0 | | | | 100 | | | | | | | | | | | | |
| 50.0 | | | | 90-100 | | | | | | | | | | | | |
| 37.5 | | | | 35-70 | 0 | 0 | 100 | 100 | | | | | | | | 100 |
| 25.0 | | | | 0-15 | 0.795 | 7.0 | 93.0 | 90-100 | 0 | 0 | 100 | 100 | | | | 93-100 |
| 12.5 | | | | | 10.09 | 89.0 | 4.0 | 0-15 | .0905 | 10 | 90.0 | 90-100 | | | | 27-58 |
| 6.3 | | | | | | | | | 7.25 | 80 | 10.0 | 0-15 | | | | 0-8 |
| PAN | | | | | 1.00 | 4.0 | | | | | | | | | | |
| TOTAL | | | | | 25.00 | 100.0 | | | 20.00 | 100.0 | | | | | | |

### COMBINED GRADATION

| BIN | Mass BATCHED | PERCENT BATCHED | PERCENT PASSING 63.0 mm | 50.0 mm | 37.5 mm | 25.0 mm | 12.5 mm | 6.3 mm |
|---|---|---|---|---|---|---|---|---|
| 3 | | | | | | | | |
| 2 | 460 | 50.0 | | | 50.0 | 46.5 | 2.0 | |
| 1 | 460 | 50.0 | | | 50.0 | 50.0 | 45.0 | 5.0 |
| 1 & 2 | | | | | | | | |
| TOTAL | | | | | 100.0 | 96.5 | 47.0 | 5.0 |
| GENERAL LIMITS | | | | | 100 | 93-100 | 27-58 | 0-8 |

### VISUAL IDENTIFICATION

Compares favorably to certified aggregate reference sample?

☐ Yes ☒ No

Gravel does not appear to be crushed as per 703-02. Contacted the Regional Material Engineer. No production allowed today as per B. Buster - (RME).

J. Belushi

3/14/01

Figure B-1

# APPENDIX C

## COARSE AGGREGATE CLEANNESS TEST

### A. SCOPE

This test method prescribes the procedure for determining the percentage of material finer than the 75 µm sieve in the coarse aggregates.

### B. SAMPLE

The sample shall be obtained and reduced to testing size in accordance with Appendix A, Sampling of Aggregates. The amount of aggregate required for a representative sample and the size of testing are as follows:

| Aggregate Size | Original Sample kg. Min. | Test Sample kg. Min. |
|---|---|---|
| #3 | 18 | 4.5 |
| #2 | 11 | 2.7 |
| #1 | 5 | 1.4 |
| #1A | 5 | 1.4 |

### C. EQUIPMENT

The following equipment is required for the coarse aggregate cleanness test:

1. Oven or hot plate
2. Pans (3- 305mm x 305 mm)
3. Stirring Spoon (305 mm)
4. Brush
5. Large capacity scale (min. capacity of 14 kg with a maximum graduation of 0.005 kg)
6. Sieves (1.18 mm and 75 µm)

### D. TEST PROCEDURE

1. Dry the test sample to constant mass.
2. Weigh the dried sample.
3. Place the dried aggregate sample in a pan or vessel, cover with water.

4. Agitate vigorously to separate the fine particles from the coarse aggregate and bring the fine material into suspension.

5. Decant the wash water containing the suspended solids immediately through two nested sieves (1.18 mm and 75 µm) taking care that none of the coarser particles are decanted into the sieves.

6. Continue Steps 2, 3 and 4 until the wash water is clear.

7. Return all material retained on the nested sieves (by flushing with water) to the washed sample in the pan.

8. Dry the washed sample to a constant mass.

## E. CALCULATION

The percentage of minus 75 µm material is computed by the following equation:

$$\%\ minus\ 75\mu m\ Material = \frac{Wosd - Wwsd}{Wosd} \times 100$$

Wosd = Mass of original sample after drying

Wwsd = Mass of washed sample after drying

An example is shown in Figure C-1.

NEW YORK STATE DEPARTMENT OF TRANSPORTATION
MATERIALS BUREAU
AGGREGATE TESTS
PORTLAND CEMENT CONCRETE PLANT

| | | | |
|---|---|---|---|
| PLANT R.U. Reale Ready Mix Inc. | | LOCATION Stafford Bridge N.Y. | REGION 5 |
| DATE 03/14/01 | TIME OF SAMPLE 10:00 am | CONCRETE CLASS A | TESTS: ☒ routine ☐ retest |
| INSPECTOR James Belushi | | CONTRACTS SERVED D259321 | |

| | FINE AGGREGATE | COARSE AGGREGATE |
|---|---|---|
| CHECK TEST(S) REPORTED ON THIS FORM | ☐ gradation ☐ minus 75 µm ☐ fineness modulus ☐ moisture ☐ visual ident. | ☐ gradation ☒ cleanness ☐ visual ident. ☐ moisture |
| CHECK SAMPLE LOCATION | ☐ belt ☐ barge ☐ stockpile ☐ other ☐ bin | ☐ belt ☐ barge ☒ stockpile ☐ other ☐ bin |

FINE AGGREGATE TESTS

| GRADATION | | | | | FINENESS MODULUS | | VISUAL IDENTIFICATION |
|---|---|---|---|---|---|---|---|
| SIEVE | WT. | % RETAINED | % PASSING | SPEC. LIMITS | SIEVE | 100 - % PASS | Compares favorably to certified reference sample? ☐ YES ☐ NO |
| 9.5 mm | | | | 100 | | | If no, explain |
| 4.75 mm | | | | 90-100 | 4.75 mm | | |
| 2.36 mm | | | | 75-100 | 2.36 mm | | |
| 1.18 mm | | | | 50-85 | 1.18 mm | | |
| 600 µm | | | | 25-60 | 600 µm | | |
| 300 µm | | | | 10-30 | 300 µm | | |
| 150 µm | | | | 1-10 | 150 µm | | |
| 75 µm | | | | 0-3 | | | |
| PAN | | | | | | | |
| TOTAL | | | | | TOTAL | | |
| | | | | | FM = (TOTAL / 100) = | | FM (MIX DESIGN) |

FINE AND COARSE AGGREGATE TESTS

| MINUS 75 µm MATERIAL | | FREE MOISTURE CONTENT | | | |
|---|---|---|---|---|---|
| AGGREGATE SIZE DESIGNATION | #1 | AGG. SIZE | FINE | NO. 1 | NO. 2 |
| WT. ORIGINAL SAMPLE (DRY) (A) | 4.53 kg | WT. (WET) (A) | | | |
| WT. AFTER WASHING (DRY) (B) | 4.49 kg | WT. (SSD) (B) | | | |
| WT. MINUS 75 µm MAT'L. (A-B) | 0.04 kg | WT. (H20) (A-B) | | | |
| % MINUS 75 µm (A-B+A ) X 100 = 0.04 / 4.53 x 100 = 0.9 % | | % FREE MOIST. (A-B+B) X100 = | | | |

Figure C-1

## F. REPORT

Report the percentage of material finer than the 75µm sieve and the computations for each size coarse aggregate tested on Form BR 317M, Aggregate Tests - Portland Cement Concrete Plant. Round off the test results to the nearest 0.1 percent.

## G. ACTION

The percent of minus 75µm material shall be compared to the specification limits of Section 501-2 and item 703-02. The Plant Inspector shall take the appropriate action indicated under Section 2-2.014 (b), Coarse Aggregate Cleanness.

APPENDIX D

# FINE AGGREGATE GRADATION TEST

## A. SCOPE

This test method prescribes the procedure for determining the gradation of the fine aggregate. The percentage of material finer than the 75 μm sieve is part of the complete fine aggregate gradation test.

## B. SAMPLE

The sample shall be obtained and reduced to testing size in accordance with Appendix A, Sampling of Aggregates. The amount of aggregate required for a representative sample is a minimum of 4.5 kg and the sample size required for testing is a minimum of 500 grams.

## C. EQUIPMENT

The following equipment is required for the fine aggregate gradation test:

1. Power driven fine aggregate sieve shaker with appropriate sieves and timer
2. Small scale (minimum 1500 gram capacity with a maximum graduation of 0.1 gram)
3. Oven or hot plate
4. Pans or trays (minimum of 3, minimum dimensions: 305mm x 305 mm)
5. Brushes (coarse and soft)
6. Stirring spoon (minimum length: 305 mm )
7. Sieves (1.18 mm and 75μm) for washing

## D. TEST PROCEDURE

A complete fine aggregate test shall include a determination of the minus 75 μm material by a washed analysis. The Materials Engineer may delete the washing requirement for routine gradation tests when at least 3 consecutive minus 75 μm material tests for a fine aggregate have been less than 1.0 %. However, the minus 75 μm material shall be determined by the washed analysis at least once per week as part of the complete gradation test. When the washed analysis is not used, the gradation shall be determined for the sizes 9.5 mm through the 150 μm sieve inclusively.

The complete test procedure is outlined in the following steps:

1. Dry the sample until the mass is constant.

2. Carefully weigh dried sample and record this mass .

3. Place the entire sample in a pan, add sufficient water to cover the sample. Agitate the sample with sufficient vigor to separate all particles finer than the 75 µm sieve from the coarser particles, and to bring the fine material into suspension.

4. Immediately pour the wash water containing the suspended and dissolved solids over a nest of the 1.18 mm (on top) and 75 µm sieve. Take care to avoid, as much as feasible, the decantation of coarser particles of the sample.

5. Add a second charge of water to the sample in the pan, agitate and decant as in (4) above. Repeat this procedure until the wash water is clear.

6. Return all material retained on the nested sieves (by flushing with water) to the washed sample in the pan.

7. Dry the washed sample until the mass is constant.

8. Carefully weigh the dried sample and record this mass as dry mass after washing.

9. Place the dried sample in a nest of 203 mm (8") diameter sieves (9.5 mm, 4.75mm, 2.36 mm, 1.18 mm, 600 µm, 300 µm, 150 µm and Pan) and shake for at least (10) minutes. Care must be taken so as not to overload the sieves. As a guide, any fine aggregate sieve (203 mm diameter) loaded with over 200 grams of materials at the end of the test may be considered as overloaded. When overloading occurs, it will be necessary to sieve only portions of the sample at a time, or to introduce a sieve having larger openings above the critical sieve and add the results to obtain the total sample gradation.

10. Carefully weigh the material retained on each sieve and the pan. Enter the mass retained in the pan as mass retained on the 75 µm sieve. This can be done because the minus 75 µm material has already been removed in Steps 3-8.

## E. CALCULATIONS

The fine aggregate gradation is calculated by using results from the wet and dry sieving. The computations necessary to obtain "percent passing" are illustrated in the following example. Figure D-1 shows how the calculations are reported on Form BR 317M, Aggregate Tests - Portland Cement Concrete Plant.

Example

A sample of fine aggregate has been tested and the following data obtained:

| | |
|---|---|
| Dry Wt. - Original Sample | 504.8 gms. |
| Dry Wt. - After Washing | 502.3 gms. |

| Sieve | Wt. Retained (grams) |
|---|---|
| 9.5 mm | 0 |
| 4.75 mm | 40.9 |
| 2.36 mm | 62.1 |
| 1.18 mm | 93.9 |
| 600 μm | 115.0 |
| 300 μm | 85.8 |
| 150 μm | 81.3 |
| Pan | 23.3* |

*Recorded as mass retained on the 75 μm sieve since this is the gradation of the washed sample.

The calculations to determine the fine aggregate gradation are described in the following steps:

Step 1

The actual amount of material retained in the pan, based on the original sample, is the same as the amount of minus 75 μm material and this amount is 504.8 - 502.3 = 2.5 grams. This result shall be shown as the mass retained in the pan.

Step 2

The amounts retained are now expressed as percentages of the original sample (dry mass before washing).

| Sieve | % Retained |
|---|---|
| 9.5 mm | $\frac{0}{504.8} \times 100 = 0$ |
| 4.75 mm | $\frac{40.9}{504.8} \times 100 = 8.1$ |
| 2.36 mm | $\frac{62.1}{504.8} \times 100 = 12.3$ |
| 1.18 mm | $\frac{93.9}{504.8} \times 100 = 18.6$ |

Step 2 (Cont'd)

| | | |
|---|---|---|
| 600 µm | $\frac{115.0}{504.8}$ X 100 | = 22.8 |
| 300µm | $\frac{85.8}{504.8}$ X 100 | = 17.0 |
| 150 µm | $\frac{81.3}{504.8}$ X 100 | = 16.1 |
| 75 µm (actual amount on pan from sieving washed sample) | $\frac{23.3}{504.8}$ X 100 | = 4.6 |
| Pan (actual amount lost from washing) | $\frac{2.5}{504.8}$ X 100 | = 0.5 |
| | | 100.0 % |

Step 3

The percent passing is determined by cumulatively adding the results of percent retained from the smallest sieve size upwards to the largest.

| Sieve | | | % Passing |
|---|---|---|---|
| 75 µm | 0.5 | = | 0.5 |
| 150 µm | 0.5 + 4.6 | = | 5.1 |
| 300 µm | 5.1 = 16.1 | = | 21.2 |
| 600 µm | 21.2 + 17.0 | = | 38.2 |
| 1.18 mm | 38.2 + 22.8 | = | 61.0 |
| 2.36 mm | 61.0 + 18.6 | = | 79.6 |
| 4.75 mm | 79.6 + 12.3 | = | 91.9 |
| 9.5 mm | 91.9 + 8.1 | = | 100.0* |

*May sometimes be only within one or two tenths of 100.0% due to rounding. This may be neglected.

## F. REPORT

The gradation test results shall be determined and reported on Form BR 317M, Aggregate Tests - Portland Cement Concrete Plant. Round off the percent passing results to the nearest whole percent.

## G. ACTION

The gradation test results shall be compared to the specification limits of Section 501-2 and item 703-07. The Plant Inspector shall take the appropriate action described in Section 2-2.015, Aggregate Gradation Control.

BR 317 M (3/97)

NEW YORK STATE DEPARTMENT OF TRANSPORTATION
MATERIALS BUREAU
AGGREGATE TESTS
PORTLAND CEMENT CONCRETE PLANT

| | | | |
|---|---|---|---|
| PLANT R.U. Reale Ready Mix Inc. | | LOCATION Stafford Bridge N.Y. | REGION 5 |
| DATE<br>03/14/01 | TIME OF SAMPLE<br>10:00 am | CONCRETE CLASS<br>A | TESTS: ☒ routine ☐ retest |
| INSPECTOR James Belushi | | CONTRACTS SERVED D259321 | |

| CHECK TEST(S) REPORTED ON THIS FORM | FINE AGGREGATE | COARSE AGGREGATE |
|---|---|---|
| | ☒ gradation ☐ minus 75 µm<br>☐ fineness modulus ☐ moisture<br>☐ visual ident. | ☐ gradation ☐ visual ident.<br>☐ cleanness ☐ moisture |

| CHECK SAMPLE LOCATION | FINE AGGREGATE | COARSE AGGREGATE |
|---|---|---|
| | ☐ belt ☐ barge<br>☒ stockpile ☐ other<br>☐ bin | ☐ belt ☐ barge<br>☐ stockpile ☐ other<br>☐ bin |

FINE AGGREGATE TESTS

| GRADATION | | | | | FINENESS MODULUS | | VISUAL IDENTIFICATION |
|---|---|---|---|---|---|---|---|
| SIEVE | WT. | % RETAINED | % PASSING | SPEC. LIMITS | SIEVE | 100 - % PASS | Compares favorably to certified reference sample? ☐ YES ☐ NO |
| 9.5 mm | 0.0 | 0.0 | 100 | 100 | | | |
| 4.75 mm | 40.9 | 8.1 | 91.9 ≈92 | 90-100 | 4.75 mm | | If no, explain |
| 2.36 mm | 62.1 | 12.3 | 79.6≈80 | 75-100 | 2.36 mm | | |
| 1.18 mm | 93.9 | 18.6 | 61.0≈61 | 50-85 | 1.18 mm | | |
| 600 µm | 115.0 | 22.8 | 38.2≈38 | 25-60 | 600 µm | | |
| 300 µm | 85.8 | 17.0 | 21.2 ≈21 | 10-30 | 300 µm | | |
| 150 µm | 81.3 | 16.1 | 5.1≈5 | 1-10 | 150 µm | | |
| 75 µm | 23.3 | 4.6 | 0.5 ≈1 | 0-3 | | | |
| PAN | 2.5 | 0.5 | | | | | |
| TOTAL | 504.8 | 100.0 | | | TOTAL | | |
| | | | | | FM = ( TOTAL / 100) = | | FM ( MIX DESIGN) |

FINE AND COARSE AGGREGATE TESTS

| MINUS 75 µm MATERIAL | | FREE MOISTURE CONTENT | | | |
|---|---|---|---|---|---|
| AGGREGATE SIZE DESIGNATION | SAND | AGG. SIZE | FINE | NO. 1 | NO. 2 |
| WT. ORIGINAL SAMPLE ( DRY) ( A) | 504.8 gm | WT. (WET) (A) | | | |
| WT. AFTER WASHING ( DRY) ( B) | 502.3 gm | WT. (SSD) (B) | | | |
| WT. MINUS 75 µm MAT.L. ( A-B) | 2.5 | WT. (H20) (A-B) | | | |
| % MINUS 75 µm (A-B÷A ) X 100 = 2.5 /504.8 x 100 = 0.49 ≈0.5% | | % FREE MOIST. (A-B÷B) X100 = | | | |

Figure D-1

APPENDIX E

# FINE AGGREGATE FINENESS MODULUS TEST

## A. SCOPE

This test method prescribes the procedure for determining the fineness modulus of a fine aggregate.

## B. GENERAL

The fineness modulus is computed from data obtained in the fine aggregate gradation test under Appendix D, Fine Aggregate Gradation Test. All the sieve sizes are used except the 9.5 mm and the 75 µm..

## C. CALCULATION

The "% Passing" results representing the total percent passing each sieve are converted to total percent of material retained on each sieve. This is accomplished by subtracting the individual "% Passing" from 100. The fineness modulus is determined by summing these results and dividing by 100.

The fineness modulus is computed below for the fine aggregate gradation example given in Appendix D, Fine Aggregate Gradation. Also this fineness modulus is illustrated on the BR 317M form in Figure E-1.

Step 1

| Sieve | Total % Pass. | | Total % Ret. |
|---|---|---|---|
| 4.75 mm | 91.9 | 100 - 91.9 = | 8.1 |
| 2.36 mm | 79.6 | 100 - 79.6 = | 20.4 |
| 1.18 mm | 61.0 | 100 - 61.0 = | 39.0 |
| 600 µm. | 38.2 | 100 - 38.2 = | 61.8 |
| 300 µm. | 21.2 | 100 - 21.2 = | 78.8 |
| 150 µm. | 5.1 | 100 - 5.1 = | 94.9 |
| | | TOTAL | 303.0 |

Step 2

The "Total % Ret." figures are then added. The fineness modulus is the sum divided by 100.

$$FM = \frac{303.0}{100} = 3.030$$

## D. REPORT

The fine aggregate fineness modulus shall be determined and reported on Form BR 317, Aggregate Tests - Portland Cement Concrete Plant. Round off the fineness modulus results to the nearest 0.01.

## E. ACTION

The fineness modulus shall be compared to the design value given on the mix design. If the average of the three most recent test results has changed by more than 0.20 from the value used in the mix design, contact the Regional Materials Engineer to make the appropriate adjustments to the concrete mix design. The Plant Inspector shall take the appropriate action described in Section 2-2.014 (d), Fine Aggregate Fineness Modulus.

BR 317 M (3/97)

NEW YORK STATE DEPARTMENT OF TRANSPORTATION
MATERIALS BUREAU

AGGREGATE TESTS
PORTLAND CEMENT CONCRETE PLANT

| | | | |
|---|---|---|---|
| PLANT R.U. Reale Ready Mix Inc. | | LOCATION Stafford Bridge N.Y. | REGION 5 |
| DATE 03/14/01 | TIME OF SAMPLE 10:30 am | CONCRETE CLASS A | TESTS: ☒ routine ☐ retest |
| INSPECTOR James Belushi | | CONTRACTS SERVED D259321 | |
| CHECK TEST(S) REPORTED ON THIS FORM | FINE AGGREGATE: ☒ gradation ☒ minus 75 µm ☒ fineness modulus ☐ moisture ☐ visual ident. | COARSE AGGREGATE: ☐ gradation ☐ cleanness ☐ visual ident. ☐ moisture | |
| CHECK SAMPLE LOCATION | FINE AGGREGATE: ☐ belt ☐ barge ☒ stockpile ☐ other ☐ bin | COARSE AGGREGATE: ☐ belt ☐ stockpile ☐ bin ☐ barge ☐ other | |

FINE AGGREGATE TESTS

| GRADATION | | | | | FINENESS MODULUS | | VISUAL IDENTIFICATION |
|---|---|---|---|---|---|---|---|
| SIEVE | WT. | % RETAINED | % PASSING | SPEC. LIMITS | SIEVE | 100 - % PASS | Compares favorably to certified reference sample? ☐ YES ☐ NO |
| 9.5 mm | 0.0 | 0.0 | 100 | 100 | | | If no, explain |
| 4.75 mm | 40.9 | 8.1 | 91.9 ≈92 | 90-100 | 4.75 mm | 8.1 | |
| 2.36 mm | 62.1 | 12.3 | 79.6≈80 | 75-100 | 2.36 mm | 20.4 | |
| 1.18 mm | 93.9 | 18.6 | 61.0≈61 | 50-85 | 1.18 mm | 39.0 | |
| 600 µm | 115.0 | 22.8 | 38.2≈38 | 25-60 | 600 µm | 61.8 | |
| 300 µm | 85.8 | 17.0 | 21.2 ≈21 | 10-30 | 300 µm | 78.8 | |
| 150 µm | 81.3 | 16.1 | 5.1≈5 | 1-10 | 150 µm | 94.9 | |
| 75 µm | 23.3 | 4.6 | 0.5 ≈1 | 0-3 | | | |
| PAN | 2.5 | 0.5 | | | | | |
| TOTAL | 504.8 | 100.0 | | | TOTAL | 303.0 | |
| | | | | | FM = (TOTAL/ 100) = 3.03 | | FM (MIX DESIGN) 2.96 |

FINE AND COARSE AGGREGATE TESTS

| MINUS 75 µm MATERIAL | | FREE MOISTURE CONTENT | | | |
|---|---|---|---|---|---|
| AGGREGATE SIZE DESIGNATION | SAND | AGG. SIZE | FINE | NO. 1 | NO. 2 |
| WT. ORIGINAL SAMPLE (DRY) (A) | 504.8 gm | WT. (WET) (A) | | | |
| WT. AFTER WASHING (DRY) (B) | 502.3 gm | WT. (SSD) (B) | | | |
| WT. MINUS 75 µm MAT'L. (A-B) | 2.5 | WT. (H20) (A-B) | | | |
| % MINUS 75 µm (A-B÷A ) X 100 = 2.5 /504.8 x 100 = 0.49 ≈0.5% | | % FREE MOIST. (A-B÷B) X100 = | | | |

Figure E-1

APPENDIX F

# AGGREGATE VISUAL IDENTIFICATION TEST

## A. SCOPE

This test method prescribes the procedures for determining if the aggregates appear to be from the sources certified by the Producer. This is a visual test generally performed in conjunction with the aggregate gradation tests.

## B. GENERAL

The test performed by comparing an aggregate sample representing the production to a reference sample for likeness in color, particle shape, etc. The reference sample shall be prepared by the Regional Materials Engineer and placed in the testing laboratory at the plant.

The reference sample shall be prepared by washing aggregate known to be from the certified source. The fine aggregate shall be dried; the coarse aggregate may be kept either dry or wet depending upon the preference of the Materials Engineer. The reference sample shall be identified by source name and number, test number, aggregate size, date prepared and the name of the person who prepared the sample.

## C. SAMPLE

Coarse Aggregate

The aggregates retained on each sieve in the gradation test described in Appendix B, Coarse Aggregate Gradation Test shall be the samples used in this test.

Fine Aggregates

The aggregates retained in the 2.36 mm, 1.18 mm, 600 µm and 300 µm sieves in the gradation test described in Appendix D, Fine Aggregate Gradation Test shall be the samples used in this test.

## D. EQUIPMENT

The following equipment is required for the coarse aggregate visual identification test:

1. Pans or trays (minimum of 4, minimum dimensions: 305 x 305 mm)
2. Oven or hot plate
3. Stirring spoon (minimum length: 305 mm)

## E. TEST PROCEDURE

1. Wash the aggregates retained on each sieve and place the thoroughly washed aggregate in individual trays.

2. Dry the samples. Do not heat the aggregate excessively because the heat may cause the particles to change color.

   NOTE: If the reference samples for coarse aggregate are kept wet, the samples shall be compared wet.

3. Place the trays containing the test samples adjacent to corresponding samples of the reference material.

4. Compare each size visually for likeness in color, particle shape, etc. If the coarse aggregate used at the plant is gravel, visually examine the particles for fractured faces as per Section 703-02 of the Standard Specifications.

## F. REPORT

The production sample shall be compared to the reference sample and the comparison shall be reported on Form BR 317 M, Aggregate Tests - Portland Cement Concrete Plant. Any differences shall be noted.
An example of the fine aggregate visual identification report is shown in Figure F-1. An example of the coarse aggregate visual identification is shown in Figure B-1.

## G. ACTION

If there appears to be a difference in the color, particle shape, or the amount of fractured faces in the crushed gravel (if applicable), contact the Regional Materials Engineer. The Materials Engineer may require further investigation of the aggregates used at the facility, including ASTM D 5821- Standard Test Method for Determining the Percentage of Fractured Particles in Coarse Aggregate.

BR 317 M (3/97)

NEW YORK STATE DEPARTMENT OF TRANSPORTATION
MATERIALS BUREAU

AGGREGATE TESTS
PORTLAND CEMENT CONCRETE PLANT

| | | | |
|---|---|---|---|
| PLANT R.U. Reale Ready Mix Inc. | | LOCATION Stafford Bridge N.Y. | REGION 5 |
| DATE 03/14/01 | TIME OF SAMPLE 10:45 am | CONCRETE CLASS A | TESTS: ☒ routine ☐ retest |
| INSPECTOR James Belushi | | CONTRACTS SERVED D259321 | |
| CHECK TEST(S) REPORTED ON THIS FORM | FINE AGGREGATE: ☒ gradation ☒ minus 75 µm ☒ fineness modulus ☐ moisture ☒ visual ident. | COARSE AGGREGATE: ☐ gradation ☐ cleanness ☐ visual ident. ☐ moisture | |
| CHECK SAMPLE LOCATION | FINE AGGREGATE: ☐ belt ☐ barge ☒ stockpile ☐ other ☐ bin | COARSE AGGREGATE: ☐ belt ☐ stockpile ☐ bin ☐ barge ☐ other | |

FINE AGGREGATE TESTS

| GRADATION | | | | | FINENESS MODULUS | | VISUAL IDENTIFICATION |
|---|---|---|---|---|---|---|---|
| SIEVE | WT. | % RETAINED | % PASSING | SPEC. LIMITS | SIEVE | 100 - % PASS | Compares favorably to certified reference sample? ☐ YES ☒ NO |
| 9.5 mm | 0.0 | 0.0 | 100 | 100 | | | |
| 4.75 mm | 40.9 | 8.1 | 91.9 ≈92 | 90-100 | 4.75 mm | 8.1 | If no, explain |
| 2.36 mm | 62.1 | 12.3 | 79.6≈80 | 75-100 | 2.36 mm | 20.4 | |
| 1.18 mm | 93.9 | 18.6 | 61.0≈61 | 50-85 | 1.18 mm | 39.0 | *Material on 600 µm and 300 µm sieves is different in color compared to reference sample.* |
| 600 µm | 115.0 | 22.8 | 38.2≈38 | 25-60 | 600 µm | 61.8 | |
| 300 µm | 85.8 | 17.0 | 21.2 ≈21 | 10-30 | 300 µm | 78.8 | |
| 150 µm | 81.3 | 16.1 | 5.1≈5 | 1-10 | 150 µm | 94.9 | |
| 75 µm | 23.3 | 4.6 | 0.5 ≈1 | 0-3 | | | |
| PAN | 2.5 | 0.5 | | | | | |
| TOTAL | 504.8 | 100.0 | | | TOTAL | 303.0 | |
| | | | | | FM = (TOTAL/ 100) = 3.03 | | FM (MIX DESIGN) 2.96 |

FINE AND COARSE AGGREGATE TESTS

| MINUS 75 µm MATERIAL | | FREE MOISTURE CONTENT | | | |
|---|---|---|---|---|---|
| AGGREGATE SIZE DESIGNATION | SAND | AGG. SIZE | FINE | NO. 1 | NO. 2 |
| WT. ORIGINAL SAMPLE (DRY) (A) | 504.8 gm | WT. (WET) (A) | | | |
| WT. AFTER WASHING (DRY) (B) | 502.3 gm | WT. (SSD) (B) | | | |
| WT. MINUS 75 µm MAT'L. (A-B) | 2.5 | WT. (H20) (A-B) | | | |
| % MINUS 75 µm (A-B÷A ) X 100 = 2.5 /504.8 x 100 = 0.49 ≈0.5% | | % FREE MOIST. (A-B÷B) X100 = | | | |

Figure F-1

# APPENDIX G

## AGGREGATE FREE MOISTURE CONTENT TEST

### A. SCOPE

This method prescribes the procedure for determining the free moisture content of coarse and fine aggregates.

### B. SAMPLE

The sample shall be obtained and reduced to testing size in accordance with Appendix A, Sampling of Aggregates. The amount of aggregate required for a representative sample and the size of sample for testing are as follows:

| Size | Original Sample (Minimum) | Test Sample (Minimum) |
|---|---|---|
| Coarse Aggregate | 5.5 kg | 1.35 kg |
| Fine Aggregate | 2.5 kg | 500 gm |

### C. EQUIPMENT

The following equipment is required for the aggregate moisture content test:

1. Oven or hot plate
2. Pans or trays (minimum of 3, minimum dimensions: 305 x 305 mm)
3. Stirring Spoon (minimum length: 305 mm)
4. Brush
5. Small (minimum capacity of 1500 grams with a maximum graduation of 0.1 gram) and Large (minimum capacity of 14 kilograms with a maximum graduation of 0.005 kg) scales.

### D. TEST PROCEDURE

The test procedures that are equally acceptable are described below. Any other procedure used to determine moisture content shall be approved in writing by the Materials Bureau.

<u>Alternate Test Procedure 1</u>

1. Weigh the aggregate sample.

2. Dry the aggregate to a saturated surface dry condition. (A saturated surface dry condition exists when the visible moisture film has been removed from the aggregate particles. This can be detected by a change in surface color and sheen of the aggregate particles.) Stir the aggregates continuously while drying using extreme care to avoid driving off more than the surface moisture.

3. Cool the sample and weigh.

Alternate Test Procedure 2

1. Weigh the aggregate sample.

2. Dry the sample to a constant mass.

3. Cool the sample and weigh.

4. Add in mass corresponding to the absorption of the particular aggregate to get a saturated surface dry condition. The absorption values may be obtained from the Regional Materials Engineer or by consulting the latest edition of the Department's Approved List of Sources of Fine and Coarse Aggregates.

   NOTE: If the aggregate moisture content is less than saturated surface dry, the moisture content will be negative.

## E. CALCULATIONS

The free moisture content is computed by using the following formula:

$$Mf = \frac{Wwet - Wssd}{Wssd} X100$$

Where:

Mf = Free Moisture, %

Wwet = Mass of Sample (Stockpile, etc.)

Wssd = Mass of Sample at a saturated surface dry condition

## F. REPORT

The aggregate moisture content shall be determined and reported on Form BR 317M, Aggregate Tests - Portland Cement Concrete Plant. Round off the moisture content to the nearest 0.1 percent.

## G. ACTION

The plant Inspector shall take the appropriate action described in Section 2-2.014 (f), Aggregate Free Moisture Content. Any fine aggregate that has a free moisture content greater than 8 % by mass may not be used for producing mixes for Department Projects (as per § 501 -3.02 A.) An example of the free moisture test report is shown in figure G-1

BR 317 M (3/97)

NEW YORK STATE DEPARTMENT OF TRANSPORTATION
MATERIALS BUREAU

AGGREGATE TESTS
PORTLAND CEMENT CONCRETE PLANT

| | | | |
|---|---|---|---|
| PLANT R.U. Reale Ready Mix Inc. | | LOCATION Stafford Bridge N.Y. | REGION 5 |
| DATE 03/14/01 | TIME OF SAMPLE 10:50 am | CONCRETE CLASS A | TESTS: ☒ routine ☐ retest |
| INSPECTOR James Belushi | | CONTRACTS SERVED D259321 | |

| CHECK TEST(S) REPORTED ON THIS FORM | FINE AGGREGATE | COARSE AGGREGATE |
|---|---|---|
| | ☒ gradation ☒ minus 75 µm ☒ fineness modulus ☒ moisture ☒ visual ident. | ☐ gradation ☐ cleanness ☐ visual ident. ☐ moisture |

| CHECK SAMPLE LOCATION | FINE AGGREGATE | COARSE AGGREGATE |
|---|---|---|
| | ☐ belt ☐ barge ☒ stockpile ☐ other ☐ bin | ☐ belt ☐ barge ☐ stockpile ☐ other ☐ bin |

FINE AGGREGATE TESTS

| GRADATION | | | | | FINENESS MODULUS | |
|---|---|---|---|---|---|---|
| SIEVE | WT. | % RETAINED | % PASSING | SPEC. LIMITS | SIEVE | 100 - % PASS |
| 9.5 mm | 0.0 | 0.0 | 100 | 100 | | |
| 4.75 mm | 40.9 | 8.1 | 91.9 ≈92 | 90-100 | 4.75 mm | 8.1 |
| 2.36 mm | 62.1 | 12.3 | 79.6≈80 | 75-100 | 2.36 mm | 20.4 |
| 1.18 mm | 93.9 | 18.6 | 61.0≈61 | 50-85 | 1.18 mm | 39.0 |
| 600 µm | 115.0 | 22.8 | 38.2≈38 | 25-60 | 600 µm | 61.8 |
| 300 µm | 85.8 | 17.0 | 21.2 ≈21 | 10-30 | 300 µm | 78.8 |
| 150 µm | 81.3 | 16.1 | 5.1≈5 | 1-10 | 150 µm | 94.9 |
| 75 µm | 23.3 | 4.6 | 0.5 ≈1 | 0-3 | | |
| PAN | 2.5 | 0.5 | | | | |
| TOTAL | 504.8 | 100.0 | | | TOTAL | 303.0 |
| | | | | | FM = (TOTAL/ 100) = 3.03 | |

VISUAL IDENTIFICATION

Compares favorably to certified reference sample? ☒ YES ☐ NO

If no, explain ______

FM (MIX DESIGN) 2.96

FINE AND COARSE AGGREGATE TESTS

| MINUS 75 µm MATERIAL | | FREE MOISTURE CONTENT | | | |
|---|---|---|---|---|---|
| AGGREGATE SIZE DESIGNATION | SAND | AGG. SIZE | FINE | NO. 1 | NO. 2 |
| WT. ORIGINAL SAMPLE (DRY) (A) | 504.8 gm | WT. (WET) (A) | 510.0 gm | | |
| WT. AFTER WASHING (DRY) (B) | 502.3 gm | WT. (SSD) (B) | 498.2 gm | | |
| WT. MINUS 75 µm MAT'L. (A-B) | 2.5 | WT. (H20) (A-B) | 11.8 gm | | |
| % MINUS 75 µm (A-B+A ) X 100 = 2.5 /504.8 x 100 = 0.49 ≈0.5% | | % FREE MOIST. (A-B+B) X100 = | 2.4 % | | |

Figure G-1

# UNIFORMITY TEST PROCEDURE

## I. SCOPE

This appendix prescribes the procedure to be followed for conducting a concrete uniformity test. The uniformity test is also known as a mixer efficiency test.

## II. GENERAL

This test is used to determine the ability of a mixer, conveyance system or hauling unit to mix or deliver uniform concrete. Samples of plastic concrete are taken from points near the beginning and near the end of discharge from a mixer, conveyance system or haul unit and a series of tests are conducted on each sample. These tests are slump, air content, air free unit mass of concrete, mortar distribution and coarse aggregate distribution. The results of the tests on the "front" and "back" samples are compared and if the concrete is uniform, the results will be similar within certain prescribed limits. An abbreviated uniformity test can be conducted by testing the front and back samples for slump and air content only. Refer to Materials Method 9.2 for individual test procedures.

The uniformity test is used only in instances where it is required by the specifications. Table H-1 prescribes the application of uniformity testing procedures to the various concrete mixing and/or delivery systems.

## III. EQUIPMENT

The following equipment is required to conduct a complete uniformity test:

1. Sample and Water Containers
2. Two (2) Slump Cones and Accessories
3. Two (2) Air Meters and Accessories
4. Washout Sieve, 6.3 mm or 4.75 mm
5. Scale, 45 kg capacity

## IV. SAMPLE

Individual samples shall be taken after discharge of approximately 15 percent and 85 percent of the load. Due to the difficulty of determining the actual quantity of concrete discharged, the intent is to provide two (2) samples that are representative of widely separated portions, but not the beginning and end of the load.

The samples shall be obtained directly from the discharge of mixers and hauling equipment prior to any subsequent transportation, spreading or vibration operations.

TABLE H-1

UNIFORMITY TEST APPLICATION

| TYPE: | 1. CENTRAL MIXERS | 2. TRANSIT AND TRUCK MIXERS | 3. HAUL UNITS AND CONVEYANCE UNITS |
|---|---|---|---|
| PURPOSE: | Establish minimum mixing times. | Check uniformity. | Check uniformity of delivery. |
| WHEN REQUIRED: | When there is a request to reduce mixing time. | When ordered by the Engineer. Conduct further tests only when routine tests frequently fail or uniformity is detected visually. | Same as 2. As per the requirements of Standard Specification 555- 3.04 |
| TEST SERIES: | 1) Slump<br>2) Air<br>3) Mass / cubic meter (Unit Wt.) -Air-Free<br>4) Coarse Agg. Content<br>5) Air-Free Mortar | Same as for Central Mixers except that an abbreviated test series may be substituted as follows:<br>1) Slump<br>2) Air | Same as 2. |
| CRITERIA: | Seven series of tests are conducted for a given mixing time.<br>Six series must meet four specified criteria to obtain approval. | One or more series of tests are conducted for the unit in question. If a unit fails to meet specified criteria, the unit shall not be used until satisfactory corrective action has been taken. | Same as 2. |

Each sample shall be large enough to perform both a slump test and an air test separately.

## V. TEST PROCEDURE

The following procedure shall be followed when conducting a complete uniformity test:

| | STEP | TEST REFERENCE |
|---|---|---|
| 1. | Obtain front and back samples. | MM 9.2 M (Appendix A) |
| 2. | Conduct slump test on each sample. | MM 9.2 M ( Appendix C) |
| 3. | Fill base of air meter and weigh in air for each sample. | MM 9.2 M ( Appendix F) |
| 4. | Conduct air tests on samples weighed in Step 3. | MM 9.2 M (Appendix D) |
| 5. | Transfer concrete in air meter base to washout sieve for each sample. | |
| 6. | Remove all mortar from each sample by washing the concrete on the sieve in water. | |
| 7. | Weigh the washout sieve containing the coarse aggregate submerged in water. This is accomplished by hanging the sieve from the scale by wires or rods. The entire sieve and its sample must be submerged. | |

## VI. COMPUTATIONS

A. The following example is used to illustrate the data obtained from field tests using "english based" equipment..

THE METRIC UNITS SHOWN IN THIS EXAMPLE HAVE BEEN MATHEMATICALLY CONVERTED FROM ENGLISH UNITS. THE VALUES HAVE BEEN ROUNDED TO REDUCE THE NUMBER OF SIGNIFICANT DIGITS IN THE EXAMPLE. HOWEVER, DUE TO THE MANY CONVERSIONS REQUIRED IN THE CALCULATIONS, <u>IT IS ADVISED THAT DURING AN ACTUAL TEST, THE VALUES BE CARRIED OUT TO AS MANY DIGITS AS POSSIBLE TO AVOID ERRORS INDUCED BY ROUNDING.</u>

| | | FRONT SAMPLE | BACK SAMPLE |
|---|---|---|---|
| 1. | Slump | 50 mm | 64 mm |
| 2. | Air | 7.0% | 6.5% |
| 3. | Wt. Concrete & Base (in Air) | 20.02 kg | 20.25 kg |
| 4. | Wt. Coarse Aggregate and Mass of Sieve (in Water) | 7.32 kg | 7.65 kg |

The following additional data is required for the calculations:

1. Volume Air Meter Base - 0.007 cubic meters
2. Wt., Air Meter Base (in Air) - 3.59 kg
3. Specific Gravity, Coarse Aggregate - 2.70 kg
4. Wt., Washout Sieve (in Water) - 1.81 kg

B. Unit Mass - Air Free Basis

The following example is used to illustrate the calculations performed to determine the variation in the air-free unit mass of concrete:

A. Unit Mass -

$$U = \frac{b}{v(1 - \frac{A}{100})}$$

Where:

U = Unit mass of concrete air-free basis.

b = Mass of concrete sample in air meter base. This is equal to the mass of the concrete and base minus the mass of the base.

v = Volume of air meter base, cubic meters.

A = Air content of sample (percent)

Using the example data:

Front Sample:

$$U_F = \frac{20.02-3.59}{.007\left(1-\frac{7.0}{100}\right)}$$

$$= \frac{16.43}{.00651} = 2524 kg / cubicmeter$$

Back Sample:

$$U_B = \frac{20.25-3.59}{.007\left(1-\frac{6.5}{100}\right)}$$

$$= \frac{16.66}{.00654} = 2547 kg / cubicmeter$$

2. Variation -

Variation = $(U_F - U_B)$ or $(U_B - U_F)$

Using the example data:

Variation = 2547 - 2524 = 23 kg / cubic meter

This falls below the maximum permissible variation of 32 kg /cubic meter.
(As per §501 -TABLE 501-5)

C. Coarse Aggregate Variation

The following example is used to illustrate the calculations performed to determine the percent variation in coarse aggregate:

1. % Coarse Aggregate -

$$P = \frac{c}{b} x100$$

Where:

P = % coarse aggregate by mass in concrete.

b = Mass of concrete sample in air meter base. This is equal to the mass of the concrete and base minus the mass of the base.

c = Saturated-surface-dry (SSD) mass of aggregate retained on sieve. This can be determined in the following manner:

$$C = \frac{(\text{Wt. Sieve \& Agg. In Water - Wt. Sieve in Water})\ (G)}{(G-1)}$$

Where:

G = Specific Gravity, Coarse Aggregate (from current NYSDOT Approved List of Aggregates).

Using the example data:

Front Sample:

b = 20.02 - 3.59 = 16.43

$$c = \frac{(7.32 - 1.81)\ (2.70)}{(2.70 - 1)}$$

$$P_F = \frac{8.75}{16.43} \text{ x } 100 = 53.26\ \%$$

Back Sample:

b = 20.25 - 3.59 = 16.66

$$c = \frac{(7.65 - 1.81)\ (2.70)}{(2.70 - 1)}$$

$$P_B = \frac{9.28}{16.66} \text{ x } 100 = 55.67\ \%$$

2. Variation -

Variation in % Coarse Aggregate = $(P_F - P_B)$ or $(P_B - P_F)$

Using the example data:

Variation in % Coarse Aggregate = 55.67 % - 53.26 % = 2.41 %

This falls below the maximum permissible variation of 6% (As per §501 -TABLE 501-5)

D. Air Free Mortar Variation

The following example is used to illustrate the calculations performed to determine the percent variation in the air free mortar:

1. Unit Mass Air Free Mortar -

$$M = \frac{b - c}{V - \left( \frac{V(A)}{100} + \frac{c}{G(1000)} \right)}$$

Where:

M = Unit Mass air free mortar, (kg. per cubic meter)

b = Mass of concrete sample in air meter base. This is equal to the mass of the concrete and base minus the mass of the base.

c = Saturated-surface-dry (SSD) mass of aggregate retained on sieve.

G = Specific Gravity, Coarse Aggregate.

V = Volume of air meter base (cubic meters)

A = Air content of sample (percent)

Using the example data:

<u>Front Sample</u>:

b = 16.43

c = 8.75

G = 2.70

V = 0.007 $m^3$

A = 7.0 %

$$M_F = \frac{16.43-8.75}{0.007-\left[\frac{(0.007)(7.0)}{100}+\frac{8.75}{(2.70)(1000)}\right]} = 2349.34\,kg\ /\ cubicmeter$$

Back Sample:

b = 16.66

c = 9.28

G = 2.70

V = 0.007 $m^3$

A = 6.5 %

$$M_B = \frac{16.66-9.28}{0.007-\left[\frac{(0.007)(6.5)}{100}+\frac{9.28}{(2.70)(1000)}\right]} = 2374.68\,kg\ /\ cubicmeter$$

2. % Variation -

% Variation in Air Free Mortar =

$$\frac{M_F - M_B}{\frac{M_F + M_B}{2}} X100$$

Using the example data:

% Variation =

$$\left(\frac{2374.68 - 2349.34}{\frac{2374.68 + 2349.34}{2}}\right) X100 = 1.07\%$$

This falls below the maximum permissible variation of 1.6 % (As per §501-TABLE 501-5)

## VII. DATA SUMMARY AND CRITERIA

Upon completion of testing, the data is summarized and compared to the "uniformity criteria". The following an example of a data summarization for a "complete" uniformity test. The example criteria shown is from the 2002 Standard Specifications which applies to central mixers and haul units. Job specifications should be consulted for the proper criteria to be utilized.

### UNIFORMITY TEST DATA SUMMARY

| Test | Variation of Example | Permissible Variation per §501. (Concrete Samples taken at two locations in the batch) |
|---|---|---|
| 1. Mass per cubic meter calculated to an Air-Free Basis | 23 kg / m³ | 32.0 kg / m³ |
| 2. Air Content, % by volume of concrete | 0.5% | 1.0 % |
| 3. Slump: | | |
| Average slump 100 mm or less | 14 mm | 25 mm |
| Average slump greater than 100 mm | | 40 mm |
| 4. Coarse aggregate content, portion by mass of each sample retained on a 4.75 mm sieve. | 2.4 % | 6.0 % |
| 5. Unit mass of air-free mortars based on average for all comparative samples tested. | 1.1 % | 1.6 % |

# APPENDIX I

## MICROSILICA SAMPLING AND TESTING

### SCOPE

This procedure describes the sampling and testing of Microsilica (§711-11) admixture used in the production of Classes DP, HP and Microsilica Overlay Concrete for Department projects. This procedure was issued as Materials Procedure # NY 90-01 on January 15, 2001 and revised on July 1, 2003.

### BACKGROUND

Microsilica is a supplementary cementitious material or admixture that increases strength and reduces permeability in High Performance and other concrete mixtures. Microsilica is highly pozzolanic, which means that high levels of reactive oxides (ie. silica, aluminum or ferrous oxide), react with calcium hydroxide in the portland cement to increase strength and form a denser paste.

Silica fume is the most common microsilica and is currently available as a densified powder or a slurry. Other powder products, such as metakaolin and rice hull ash, also appear on the Department's Approved List of Materials as a Microsilica admixture.

All these products are typically pH neutral (pH 6.0-8.0), and must meet the chemical and physical requirements of §711-11. In order to assure their quality, routine monitor sampling and testing will be performed at the point of use. The concrete batching facility is typically the point of use, and is generally the source of contamination from other products such as portland cement.

### SAMPLING

Refer to §584-2.01B and §501-2.03 B of the Standard Specifications.
A sample of the Microsilica will be taken by or witnessed by a Department Representative (Inspector).
Microsilica from an approved supplier must be accompanied by written certification stating that the material supplied meets the requirements of §711-11 of the Standard Specifications, and /or AASHTO M307. As of July 10, 2001, the producers of microsilica agreed that the certification will also include the pH level of the material being supplied.

#### SLURRY.

BATCH OR CENTRAL MIX PLANT - Take the sample directly from the storage container at the plant. Allow approximately 12 liters (3 gallons) to flow out before taking the actual sample. This initial quantity may be placed directly back into the storage container. Place the actual sample directly into a clean, dry, 1 liter (1quart) plastic jar. Obtain one sample for each day of production of either Class DP, HP or Microsilica overlay concrete. If a storage tank is recharged during a day's production, obtain another 1 liter sample.

MOBILE MIXER - Take the sample directly from the bypass valve in the microsilica feed line. Allow approximately 4 liters (1 gallon) to flow out before the actual sample is obtained. This initial quantity may be placed directly back into the storage container. Place the actual sample directly into a clean, dry, 1 liter (1quart) plastic jar. Obtain one sample for each day of production of either Class DP, HP or Microsilica overlay concrete. If a mobile mixer storage container is recharged during a day's production, obtain another 1 liter sample. Any mobile mixer that is not equipped with a microsilica line bypass valve should not be used.

#### POWDER.

Obtain the sample directly from the tanker prior to charging the microsilica bin. If the delivery was made when the Inspector was unavailable, the Producer shall direct the Inspector to the approved

sampling location (as per § 501-2.03 B.) for the bin that was charged. The bin may not be used for Department projects until the sampling location is safe and free from contamination, as determined by the Inspector. Any evidence of caking (or hardening) of microsilica in either the tanker's discharge lines, or the facility's supply lines or storage bin, is an indication of contamination or physical deficiencies in the handling of the product. The caking may be caused by; moisture in the lines or the bin; residual contaminates from another product (such as portland cement) in the system, too many metallic connections in the tanker's discharge or the facility's supply lines; the presence of a "deflection box" on the facility's bin supply system. These deficiencies have been known to allow unmixed microsilica "chunks" to appear in structural concrete.

Place the sample directly into a clean, dry, 1 liter (1quart) plastic jar. Obtain one sample for each day of production of either Class DP, HP or Microsilica overlay concrete. If a storage tank is recharged during a day's production, obtain another 1 liter sample.

PROCEDURE FOR ON - SITE PURITY TESTING OF MICROSILICA

EQUIPMENT:
Wide Range pH test paper, a clean 120 ml (4 fluid oz.) paper cup (or equivalent sized vial), potable water.

TESTING :
-Use the test paper to pretest the water for alkalinity/acidity. Place approximately 30 ml (1 fluid oz.) of the water in the paper cup or vial. Dip the pH test paper into the water. Any color change (generally red if acidic or green if alkaline) signifies unsuitable water for testing.
- Using suitable water, place approximately 0.5 grams of the microsilica sample into the paper cup with the test water and gently agitate.
- Dip another pH test paper into the microsilica/water solution. Look for any color change on the test paper. A blue-green or green color signifies alkaline contamination that is most likely attributable to either portland cement or Ground Granulated Blast Furnace Slag (GGBFS) intermixed with the microsilica. This contamination may be limited to the immediate sampling area, or it may represent contamination of the entire bin. Compare the measured pH with the certification for the shipment. If the measured pH falls within ±1 of certified pH level from the manufacturer, the sample is not contaminated.

- If the sample is contaminated, the Inspector may:
1. Allow the Producer to run additional material from the bin, in an effort to obtain another sample that may be more representative of the bin contents.
2. Deny production of any mixes that require microsilica until the bin is proven to be uncontaminated.
3. Inform the Producer that, if the Materials Bureau determines that the sample does not meet the Physical and Chemical requirements of Item § 711-11, the contents of the bin is subject to rejection.

ACTION
For further testing by the Materials Bureau;
Retain one reference sample for each 3 days of production per structure, with a minimum of one sample per structure and / or shipment of microsilica. Print the following information on the sample container with an indelible marker: Manufacturer of microsilica, Contract number, Date/time sampled, Facility Number/ Concrete Mobile Number. If the sample has been tested for purity using the pH test kit; write "pH tested"and write the pH number in Box 16 of the BR 240 Transmittal form.

Send the sample to the Materials Bureau for testing. Accompany the sample with a properly completed BR240 transmittal form (See figure I-1). Do not allow slurry samples to be exposed to extreme temperatures (below 0°C (32°F) or above 30°C ( 85°F)).

## REPORTING

After testing, the Materials Bureau will produce a "TEST ACTION TRANSMITTAL, NYSDOT MATERIALS BUREAU" with the appropriate action (accept or reject) indicated. This transmittal will be sent to the Regional Materials Engineer or Testing Agency. Distribute the transmittal as follows:

1. Original transmittal copy to project Engineer-in-Charge.
2. Copy of transmittal to Regional Materials Engineer or Testing Agency.

BR 240a (11/74)

SAMPLE AND ACCEPTANCE TRANSMITTAL
NYSDOT MATERIALS BUREAU

SERIAL NO. 220855 | DATE REC'D. | TEST NO.

To:

Material Represented by the Sample Described Below Was ______

On ______ For ______

(Action Official Only When Validated Below By The Materials Bureau)

UPPER PORTION FOR MATERIALS BUREAU ONLY — INSPECTOR TO COMPLETE ALL APPLICABLE BOXES BELOW

16. ADDITIONAL INFO. (SEE INSTRUCTIONS ON REAR)
1 LITER CAN FROM CRANESVILLE BLOCK, UTICA, N.Y., FAC. # 20423
* SILO SAMPLE TAKEN TO VERIFY PH PROBLEM. (TESTED BY REGION) PH=7

RETAIN PINK COPY FOR YOUR RECORDS
FORWARD ALL OTHERS TO MATERIALS BUREAU

1. MATERIAL: MICROSILICA
2. ITEM NO.: 711-11
3. DATE SAMPLED: 4/6/05
4. CONTRACT NO.: D250123
5. SUPPLIER AND LOCATION: ELKEM MATERIALS – PITTSBURGH, PA
6. QUANTITY IN LOT: 21.28 MT
7. LOT NO.: HB13200
8. MANUFACTURER AND LOCATION (IF DIFFERENT THAN ABOVE): AXIM CATEXOL – MIDDLEBRANCH, OH
9. BATCH NO.: 4500235936
10. DATE OF MFGR.: —
11. SAMPLED AT: ☐ MILL ☒ PLANT ☐ JOB
12. TYPE: ☐ CONTROL SAMPLE ☐ INFO. SAMPLE ☐ BPR SAMPLE ☒ APPROVED LIST MAT. ☐ CERTIFIED MAT.
13. SAMPLED FROM: SILO * @ # 20423
14. SAMPLED BY (INC. DIST. NO. OR AGENCY): T. JOHN
15. CONTRACTOR AND PROJECT LOCATION: LANCASTER / JUDD RD.

MATERIALS BUREAU VALIDATION

Figure I-1

APPENDIX J

ANNUAL INSPECTION RECORD

New York State Department of Transportation
Materials
Utica, New York

2001

*PORTLAND CEMENT CONCRETE PLANT*

*ANNUAL PLANT APPROVAL RECORD*

| | |
|---|---|
| Facility No.: 28185 | Plant Name: Maxi Ready Mix |
| Vendor No: 86-662998 | Address: 306 East Walnut Street |
| Plant Phone No.: 315-363-4240 | City: Oneida State: NY Zip: 13424-0688 |

| | | |
|---|---|---|
| Business Name: Maxi – Ready Mix. | | |
| Address: P.O.Box 688 | | |
| City: Oneida | State: NY | Zip: 13424-0688 |

| | | |
|---|---|---|
| Plant Type: Central Mix | Make: Custom Made | Capacity: 6.0 CM |
| Automation: Joner | | |
| Recorder Brand: Okidaki 700 | Recorder Type: Ticket | |

| | |
|---|---|
| Annual Approval Date: 28-Feb-01 | Automation Approval Date: 28-Feb-01 |
| Approved Batching Range: 1.2 - 8.4 CM | Pozzolans (Y/N): 3 |

**Remarks / Limitations / Restrictions:**

0.1 CM Increments – New Automation

**Inspected By:**

Oswald P. Osborne — Region 2 Materials | CE I — Title | 2-28-01 — Date

**Regional Recommendation for Approval:**

Gregory Nettles — Regional Director | 03/02/01 — Date

**Approved:**

T.E. Petty — Director, Materials Bureau | 3/27/2001 — Date

Quattro Pro file C:\qpwfiles\iast\BPL.wb

Figure J-1

BR 180-2b (4/74)

**USUAL AGGREGATE SOURCES**

- **COARSE**: [X] CRUSHED STONE [ ] CRUSHED GRAVEL [ ] CRUSHED SLAG
  - SOURCES: HANSOM AGGREGATES - MIDDLEVILLE 2-10R
- **FINE**: [ ] NATURAL SAND [X] MANUFACTURED SAND
  - SOURCES: HANSOM AGGREGATES - MUNNSVILLE 2-3FM
- **AGGREGATE DELIVERY**: [X] TRUCK [ ] BARGE [ ] RAIL [ ] ______
- **AGGREGATE STOCKPILES**: [X] LARGE STOCKPILES AT PLANT [ ] SMALL STOCKPILES AT PLANT [ ] BARGE AT PLANT
  - [ ] NO STOCKPILES, CONTINUOUS DELIVERY [ ] ______
  - SEPARATED ADEQUATELY [X] YES [ ] NO

**CEMENT**

- STORAGE CAPACITY (BBLS): 550
- NO. of SILOS: 3
- NORMAL SUPPLIERS: LAFARGER
- RECEIVED BY: [ ] TRUCK [ ] BARGE [X] RAIL
- SEAL CONTROL ADEQUATE [X] YES [ ] NO

**AGGREGATE**

- [ ] BLENDED AT SOURCE [X] AT PLANT BY BELT [ ] OTHER (Describe) ______
- **SAMPLING POINT**: [X] STOCKPILES [ ] BELTS [ ] BARGE [ ] BIN [ ] WEIGH HOPPER
  - [ ] BUILT-IN SAMPLING DEVICE [ ] OTHER (Describe) ______

**WATER**

- SOURCE: WELL
- MOISTURE METER INSTALLED [X] YES [ ] NO

**ADMIXTURE**

- **STORAGE**: [X] BULK SYSTEM [ ] DRUMS [ ] OTHER ______
  - NO. DISPENSERS: 4
- **EQUIPMENT**: [X] VISUAL TUBE [ ] TIMER CONTROL [ ] METER CONTROL
  - [ ] PROBE CONTROL
  - INTERLOCKED WITH AUTOMATION [X] YES [ ] NO
- USUAL AEA USED: MASTER BUILDERS MBAE 90
- USUAL WATER REDUCER USED: POZZOLITH 322 N
- USUAL RETARDER USED: " " POZZOLITH 100XR
- OTHER ADMIXTURE USED: RHEOBUILD 1000

**BATCHING SCALES AND/OR METERS**

| ITEM | TYPE: Dial | TYPE: Beam | TYPE: Digital | SLAVE SCALE: Yes | SLAVE SCALE: No | MAKE | CAPACITY (KG) | MIN. GRAD (KG) |
|---|---|---|---|---|---|---|---|---|
| AGGREGATE SCALE | | | LOAD CELL | | | TRANSDUCER | 10000 | 5 |
| AGGREGATE SCALE | | | | | | | | |
| AGGREGATE SCALE | | | | | | | | |
| CEMENT SCALE | | | LOAD CELL | | | " | 2500 | 2 |
| CEMENT SCALE | | | | | | | | |

| WATER: Scale | WATER: Meter | CAPACITY (~~GAL/LB~~) LITERS | MIN. GRAD. (~~GAL/LB~~) LITERS |
|---|---|---|---|
| | X | 999 | 3.78 |

**SCALE CHECKING FACILITIES**

- [ ] PLATFORMS [X] HOOKS
- NO. 50 LB. WT. AVAILABLE: 20
- [X] CHAINS/CABLES [X] OTHER (Describe) METRIC MAKE UP WEIGHTS
- SCALE TECHNICIAN HIRED OR CONTRACTED [ ] YES [X] NO
- DATE OF LAST SCALE CHECK: 2/28/01

Figure J-1

BR 180 3b (4/74)

| | | | |
|---|---|---|---|
| **BATCHING/ RECORDING EQUIPMENT** | CONTROL TYPE | [x] AUTOMATIC [ ] MANUAL | DOES MANUAL CONTROL PLANT HAVE CEMENT INTERLOCK? [ ] YES [ ] NO |
| | MAKE | AUTOMATION SYSTEM COMMAND / ALKONIO | RECORDER OKIDOKI [ ] TAPE [ ] GRAPH [x] TICKET |
| | FORMULA SELECTION | [ ] CARDS [ ] PRESETS [ ] OTHER N/A | |
| | ARE SCALES, LEVERS, AND RECORDERS SHROUDED AS REQUIRED? [ ] YES [ ] NO | | |
| | MINIMUM BATCH WEIGHTS | AGGREGATE ~~(LB.)~~ KG 500 | CEMENT ~~(LB.)~~ KG 400 |
| | LIMITATIONS OR RESTRICTIONS MIN. BATCH WT. FOR CEMENT WHEN MICROSILICA IS BATCHED = 800 KG (0.05% TOL.) | | |
| **PLANT FEATURES (DRY BATCH)** | LAYOUT [x] ONE STOP [ ] TWO STOP | NO. AGGREGATE BINS | NO. AGGREGATE BATCHERS |
| | | NO. CEMENT BINS | NO. CEMENT BATCHERS |
| | PROVISIONS FOR WINTER CONCRETE STEAM FOR AGGS., HOT WATER FOR MIXING. | | |
| **CENTRAL MIX PLANT DETAILS** | MIXER CONDITION [x] Satisfactory [ ] Unsatisfactory | TYPE [x] TILTING [ ] VERTICAL SHAFT [ ] OTHER | |
| | | MAKE REX | RATED CAPACITY ~~(CY)~~ (C.M.) |
| | MIXING TIME [x] 90 SEC. [ ] 75 SEC. [ ] 60 SEC. | | |
| | DATE OF REDUCED MIX TIME APPROVAL | | |
| | CHARGING SEQUENCE (DESCRIBE) POZZOLANS TO BE WEIGHED LAST IN WEIGHING SEQUENCE. (MICROSILICA LAST) | | |
| **TIME/DATE PRINTING ON DELIVERY TICKETS** | [x] PRINTED BY TICKET-TYPE RECORDER | | |
| | [ ] PRINTED ON TAPE BY TAPE-TYPE RECORDER; TAPE SENT W/DELIVERY TICKET | | |
| | [ ] PRINTED BY TIME-CLOCK DEVICE | | |
| | [ ] NOT USED; TICKET REQUIREMENTS WAIVED (ON-SITE PROJECT PLANTS SUPPLYING PAVEMENT CONCRETE ONLY) | | |
| | [ ] OTHER (DESCRIBE) | | |
| **DELIVERY UNIT TYPES** | [x] TRUCK MIXERS | [x] OPEN HAUL UNITS | |
| | [x] TRUCKS APPROVED FOR TRANSIT MIXING | | |
| | [ ] OTHER (DESCRIBE) | | |

Figure J-1

BR 180-4b (4/74)

**INSPECTION FACILITIES**

LOCATION AND DESCRIPTION

TRAILER ON SITE 13'x25'

(OFFICE TRAILER)

ROOM DIMENSION: 385cm x 760cm

INSPECTOR'S EXCLUSIVE USE: ☒ YES ☐ NO (EXPLAIN)

DOES INSPECTION FACILITY MEET THE REQUIREMENTS OF SECTION 501-~~3.02F~~ 2.03H ☒ YES ☐ NO

~~IF NO, EXPLAIN.~~ NEW FIREPROOF FILE CABINET INSTALLED IN LAB (1/15/01)

FAX MACHINE INSTALLED 2/10/01

CONDITION: ☒ SATISFACTORY ☐ UNSATISFACTORY (EXPLAIN)

CAN FACILITY BE IMPROVED FOR BETTER OPERATIONS? ☐ NO ☒ YES (EXPLAIN)

SEE BELOW.

PHONE NO.: (312) 201-5555

IF NO TELEPHONE, DESCRIBE ALTERNATE MEANS OF COMMUNICATIONS UNDER REMARKS

**SAFETY**

AREAS NEEDING IMPROVEMENT FOR SAFER INSPECTION DUTIES

ENTRANCE TO LAB (STOOP) WILL NEED REPLACING.

(BOTTOM STEP WOBBLY)

REMARKS

Figure J-1

# APPENDIX K

## SCALE AND METER INSPECTION PROCEDURE (AS PER MATERIALS PROCEDURE 01-01)

### SCOPE

This procedure describes the process of completing 90 calendar day interval accuracy checks for hopper scales, truck scales, continuous weigh systems, and liquid asphalt meters as issued by Materials Procedure # MP 01-01. Annual scale and meter checks prior to the start of Department work will still be completed by the Department.

### BACKGROUND

Scale and meter checks are an important function in maintaining the quality of both Hot Mix Asphalt (HMA) and Portland Cement Concrete (PCC). Properly functioning scales and meters are one part of an automation system that ensures individual materials are correctly batched. Scale and meter accuracy is important for a number of reasons: Proper material proportions, acceptability, ease of handling and placement, and in some cases payment determination. Without properly batched materials the quality of both HMA and PCC is jeopardized, with the potential for reduced material payments, material rejection and/or removal.

The need to complete scale checks is sometimes hampered by the need to produce HMA or PCC in order to supply construction projects in a timely fashion. Scale and meter checks sometimes need to be completed during off-hours (nights or weekends) when the availability of NYSDOT inspection is difficult.

This procedure establishes the process for producers to perform 90 calendar day scale and meter checks at their convenience to appropriately progress the production of HMA or PCC. This procedure does not change requirements for automation and recordation inspections, nor scale or meter checks associated with annual inspections.

### PROCEDURE

Refer to the appropriate Standard Specifications for HMA and PCC batching facilities for specific facility requirements. In general, scale and meter checks are required annually prior to Department work, at intervals of not more than 90 calendar days, when a plant location changes, or when material production problems occur. The Department will conduct and/or observe scale and meter checks for annual inspections prior to the start of Department work, when a plant location changes, and as ordered by the Regional Director. Scale and meter checks shall be completed at intervals of not more than 90 calendar days in accordance with one of the following options:

I DOT INSPECTION. The Department will perform or observe required scale and meter checks. The producer shall notify the Regional Materials Engineer (RME) at least 2 weeks prior to the end of a 90 day interval to arrange for completion of scale and meter checks. Scale and meter checks will be performed by the Department using the procedures outlined in Materials Method 27.

II PRODUCER INSPECTION. Producers shall perform scale and meter checks, at their convenience, according to the following procedure:

a. The producer shall provide written notice to the RME of intention to perform scale and meter checks.

b. Materials Method 27 shall be followed, using appropriate NYSDOT forms. The RME will provide a copy of Materials Method 27 and appropriate forms prior to scale and meter checks.

c. Scale and meter checks shall be performed by a qualified technician, capable of making necessary adjustments to correct deficiencies at the time of the check.

d. The Producer shall provide a certification that all scale and meter checks are properly performed and accurate. The certifying party shall be familiar with Materials Method 27, independent of or employed by the Producer, and **shall receive prior approval of the RME**. To receive RME approval, the certifying party shall perform a scale and meter check witnessed by the Department to demonstrate understanding of Materials Method 27 procedures and documentation requirements.

e. All forms shall be initialed by the qualified technician. Further, the certifying party shall sign all forms, including a statement on the forms that "all scale and meter checks were properly performed according to Materials Method 27 and found to be accurate."

f. Scale and meter checks shall be completed prior to the end of a 90 calendar day interval.

g. The Producer shall notify the RME of the planned check date and time at least 1 week prior to performing a scale or meter check. If a scale or meter check must be rescheduled for any reason, the Producer shall notify the RME at least 24 hours prior to the originally scheduled date and time of the reason for the change and shall provide the RME with the new date and time for the check. The RME will have the option of sending an unannounced representative to witness the entire or any portion of the scale and meter check.

## REPORTING

Immediately upon completion of scale checks a copy of all forms shall be faxed to the RME. Copies of all forms shall be provided to the Department's plant inspector. Original forms shall be provided to the Department at the direction of the RME.

## ACTIONS

Any scale or meter found to be inaccurate shall be corrected immediately. Production from the facility shall progress in accordance with the requirements of the Standard Specifications. Any scale or meter that is routinely found to be inaccurate will be checked by the Department until accuracy can be maintained. These checks by the Department will be performed for 2 consecutive 90 calendar day interval checks, unless problems warrant the need for more frequent checks.

Upon receipt of scale and meter check forms and certification, the RME will review the forms for accuracy and completeness. The RME will notify the producer of acceptability by close of business, the first business day after receipt of the forms and certifications. Scale and meter check forms that are not received immediately after being performed or found to be incomplete will result in the immediate disapproval of the facility.

Improperly performed scale and meter checks will result in a re-check of the scales and meters, with a Department representative present. The "Producer Inspection" option shall be rescinded until the producer can demonstrate understanding of Materials Method 27 procedures and documentation requirements.

Facilities where scale or meter checks are not performed within the 90 calendar day interval, or where check results are not properly reported to the RME, will be disapproved from producing materials for Department projects until acceptable checks are completed. A lapse in scale or meter checks by more than 30 calendar days shall require a check to be completed by the Department.

# End of Manual

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LRI